ILLC Magazine

August 2005

On Art, Logic, and What Is In Between

An interview with ILLC alumna Marianne Kalsbeek

Old Loves Die Hard

The Importance of Dreckeffekts

The Mirror on the Beach

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The Logic of Serendipity

Interview with Tanja Kassenaar and Marjan Velthuisen

Institute for Logic, Language and Computation

Dear Alumni staff members, PhD and MoL students, and affiliates,

A researcher at the ILLC is more than a factory creating definitions, theorems, or computer programs. In this issue of the ILLC magazine, we aim to reveal the personalities behind the theorems: those who make the ILLC such an extraordinary place to do research and meet people from many different disciplines.

For everybody in the ILLC, it is probably the case that their personal life and research are hardly separable. We include a personal interview with an ILLC alumna who reflects back on her past experience as a logician, sharing with us its influences on her current life as an artist. Further, we give attention to the personal dimension of the path to scientific discoveries: serendipitous experiences. Finally, we are proud to present the next generation of the ILLC - its PhD and MoL students; you can meet them on the back cover.

Working on this issue, together with so many people, has been a real privilege for us and we wish to thank everyone involved for their enthusiasm and cooperation. We challenge the reader to have as much fun reading this issue as we had making it.

The editors,
Reut Tsarfaty and Merlijn Sevenster

Announcements

Left

- Near the end of 2004, two of the people who started the cooperation between philosophers and mathematicians that would eventually lead to the foundation of our research institute, gave their goodbye lectures: Renate Bartsch and Dick de Jongh.
- In June, Michael Masuch retired. A great propagator of logic in the social sciences, he joined the ILLC with his *Applied Logic Lab* in 1996. He and Maarten de Rijke founded the *Language and Inference Technology* (LIT) group in 2001.
- In April, one of the most dedicated ILLC members, Maarten de Rijke, left the ILLC and took up a full professorship at the Informatics Institute. A large part of the LIT-group moved with him, among them Maarten Marx, who also was a very active ILLC member.

New

- As of August 1st, 2004, Jelle Zuidema has been appointed a NWO postdoc position on the project 'Unsupervised Grammar Induction' in cooperation with Rens Bod.
- As of September 1st, 2004, Maricarmen Martinez has been appointed lecturer in the field of Mathematical Logic for the period of one year.
- As of the beginning of 2005, Astrid Kramer and Bas van Vlijmen have begun working for the ILLC, in cooperation with the Institute for Informatics, to study the market for internationalization projects.
- During Ingrid van Loon's maternity leave, from February to mid-July, Wil van Zijl is running the ILLC administration.

Projects and Awards

- The Committee of the 4th Conference on "Understanding and Creating Music" honored Aline Honingh with the 2004 "Nicola Ugo Stame" award for young scientists.
- The Dutch Science Foundation (NWO-GW) granted Henkjan Honing's research proposal. The research will explain and evaluate the impact of the cognitive revolution on music research, as well as explore the possibilities of a new paradigm for music research in which the humanities and cognitive sciences interact.
- The 2004 Bakkenist Jong Talent Afstudeerprijs has been awarded to our master's student Mrs. S.D.C. Wehner, who graduated in July with a master's thesis on the subject of Quantum Computing.
- Boaz Leskes, supervised by Leen Torenvliet, received the 5th UvA Thesis Award for his thesis 'The Value of Agreement: A New Boost Algorithm'. Leskes developed an entirely new model for automated learning and also put it into practice with extensive programming.
- The European Commission has positively evaluated the EST Host Fellowship GLoRiClass "Games in Logic Reaching Out To Classical Game Theory" coordinated by Benedikt Löwe. This fellowship is supposed to fund research training of PhD students involved in game theory and logic. Contract negotiations have started, and it is expected that in the period of 2006-2010, eight new PhD students funded by GLoRiClass will become members of the ILLC.
- On the basis of the Mozaiek workshops, NWO awarded MoL graduates Reut Tsarfaty and Loredana Afanasiev with a grant for a PhD position and highly recommended Fenrong Liu. Reut and Fenrong are currently employed as PhD students at the ILLC.

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Universiteit van Amsterdam
Plantage Muidergracht 24
1018 TV Amsterdam
The Netherlands

Tel: +31 (20) 525 6051
Fax: +31 (20) 525 5206
E-mail: illc@science.uva.nl
WWW: http://www.illc.uva.nl/

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Reut Tsarfaty and Merlijn Sevenster

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On Art, Logic, and What Is In Between

An interview with ILLC alumna Marianne Kalsbeek

Marianne Kalsbeek, (photographer: Tian-Sying Yang)

It is always hard to decide what to do after you finish your PhD. For Marianne Kalsbeek, it may have been even harder. After defending her PhD dissertation "Meta Logics for Logic Programming" under the supervision of Johan van Benthem and Krzysztof Apt, Marianne decided to give up a promising academic opportunity and become an artist. The ILLC magazine asked Marianne about the transition from logic to art and found out about the differences and parallels between these two, supposedly disjoint, worlds.

When I first met Marianne Kalsbeek she told me: "If you would have asked me when I was 20 or 30, 'Will you ever be an artist?' I would have said, 'No...why do you ask?'... I was a mathematician and that was more or less it." In fact, Marianne started out as neither a logician nor an artist. She grew up in Uithoorn and moved to Amsterdam at the age of 18, beginning her undergraduate studies in the department of psychology.

Marianne, what led you to study logic?

I was actually a student of psychology first, and I was very unhappy there. I had a friend, Michiel [van Lambalgen], whom I've known since I was 18. He was studying philosophy at the time and he was teaching logic to first year philosophy students. I used to visit Michiel. He had this desk, stacked with open books and notebooks filled with notes. He was very passionate about his work. At the time, Michiel was the only one I knew that was really passionate about something, and not just passionate about it, but working on it as well. We used to talk about what he was doing and what I was doing, and at some point he asked: "Why don't you come and sit in one of my introduction to logic classes?" So I said, "Well, why not?"

I went to this introduction to logic class and I was hooked from the first moment. I came from this world, psychology, where you needed to have an opinion about everything. I was reading these psychology books and I disagreed with almost every sentence I read, but I couldn't really explain why or give solid reasons. I think I was also basically quite confused by the world at that time. And then there was logic, which was free of all of

The act of creation is pretty much the same everywhere

Argumenten Voor een Heilige Dag, Marianne Kalsbeek

that, pure in a sense. During this class I had decided that I am going to study mathematics. I studied the three years of the basic program and then a specialization of four years, and meanwhile I did a lot of extra things. I did a lot of physics, a huge amount of philosophy, and logic. Ultimately, I wrote my doctoraal thesis on provability logic, titled "An Orey-Sentence for $I\Delta_0 + \Omega_1$".

When I started my PhD, I was working on provability logic, but then logic programming got my interest. A friend of mine and an enthusiastic researcher, Frank van Harmelen, introduced me to the ideas and was more than happy to teach me the basics. My supervisors, Johan van Benthem and Krzysztof Apt thought it was a good idea, so I decided to switch.

When did you start drawing?

Most of the painters I know started out when they where 6, so when they are 45 they have almost 40 years experience... I started to do drawings when I was 31 or 32 - that's really late. I started to make drawings sort of accidentally. I was doing my PhD then.

It was in the summer and I was doing some sculpting in France as a pastime activity. One afternoon, it was raining and I couldn't sculpt, so I joined one of the indoor drawing and painting lessons. This lesson opened doors in my mind and made it possible for me to do drawings, real drawings... I was hooked.

When did you decide to explore your artistic inclinations more seriously?

During my PhD, I used to do drawings on the weekends or during the summer holiday, but then it started to pull on me stronger and stronger. After I defended my dissertation, I rented a studio for a few months and I started to work there every day. Once I had done that for a month or two, I just didn't want to leave anymore.

At the time I was going to go to Italy, since I had a grant to do research work with Alberto Pettorossi. I was looking forward to that. I thought I could learn a lot both in terms of mathematics and from Pettorossi as a person, as he is a very good and moral person. I had to make a really hard decision. It was not that I didn't want to do logic, but I didn't want to leave the drawings. So, I had to tell Pettorossi that I wasn't coming. I wrote him and explained what had happened. He was very sympathetic, and he completely understood. I also had to tell Johan [van Benthem]. I was very nervous about it. Your thesis advisor puts a lot of time and effort in you, so I imagined that he would think of it as a waste of time and energy. But Johan was very sympathetic as well. He said something like: "That's really nice, and that's very interesting. I am very happy when people I know and like do something that I really can't do and that I know nothing about".

Can you describe your creative process?

Some of my drawings, a bit to my own amazement, are rather realistic-you can see a cloud, or you can see the sea. Here is how it happens. I go to the sea or I watch the clouds for a long time, and then I go back to my studio and I try to open myself up to the mood or the movements. I try to let my body move with it, and I try not to let my discursive and analytical mind interfere. I take myself out of it as much as possible.

Art for me is very much a physical thing. I enjoy the friction, the fact that you have things happen. Also, I like the fact that when you have done something, it is there as a physical object. It can be good or bad and you can either throw it away or enjoy it afterwards.

What kind of art do you like?

I cannot really say that I like this or that particular kind of art. It's not about a certain style... it's

Praten Met Pinsky, Marianne Kalsbeek

probably about a certain honesty, a certain way of feeling or being. It's hardly something I could describe. I recognize it because I see something in it and it gives me the chills, it makes me sigh...

Can you think of any parallels between doing art and doing logic or mathematics?

I think the act of creation is pretty much the same everywhere. Mathematics is a creative thing. When I used to think about a theory or a theorem, I usually had this sense of knowing that something is there, something that you can't really see or even talk about yet, but you know that it's there, and then you work up to it. So with my drawings it is pretty much the same.

Also, when you are doing logic or mathematics, you are always doing things that are slightly beyond you. For art, it is pretty much the same. You know at any moment that you are reaching out for something that's not yet there. You also know that you can fail miserably, and maybe you are really wrong, but still you try.

What about differences?

Some differences are obvious. There is no real right or wrong in art. In mathematics things are much more clear-cut; you can say, 'This is a proof', or 'This is right'. Also, in logic you work on a very impersonal level. Basically, you are studying abstract structures, so the material is very different.

And, of course, if you do logic, you can hardly talk about it with anybody; nobody will understand you except your colleagues. People are rather frightened because you are doing rather incomprehensible things. When I talk with people now, they often have the feeling that they understand what I am doing, because it seems obvious, they can look at the picture. People are also very interested in the technique, so they are happy to hear about it. However, to really explain or talk in depth about what I am doing, it takes someone who is really interested.

What kind of skills have you acquired during your studies at the ILLC from which you can still benefit as an artist?

One of the things you learn as a PhD student is to be very critical of your own work. It becomes your daily routine - after you do something, you step back and try to test it yourself from all sides. I try to do this with my drawings as well. It is more difficult to step back because the nature of the work is more personal, but I still try.

On the same level, your colleagues are also very critical, so you get used to being criticized. You can give a talk one day, and someone in the audience will shout, "But that's just rubbish!" These things happen. But this is just work, so it's not to be taken personally. I think this kind of training - understanding that people can attack your work without attacking you as a person - is very valuable.

Do you have any message for the readers, or any advice for PhD students at the ILLC?

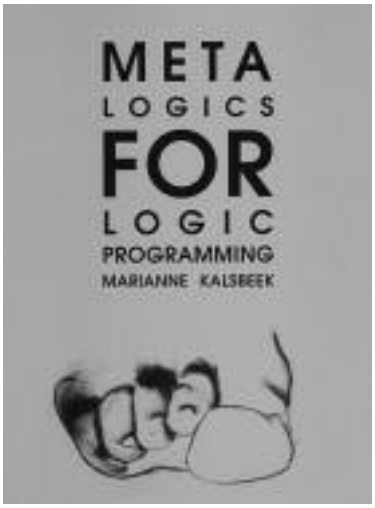
One of the good things that I've learned from doing my PhD and finishing it is that if I put my will to something, and I go for it, and work hard, I can do it - no matter what. The circumstances were rather difficult for me, but I did it anyway. I was immensely proud afterwards, and I can still draw strength from that. It was an achievement or a victory over myself, and that has given me enormous confidence.

So now I know, and I think it goes for everybody: if you want to do something, you should just go ahead and do it, and give it your best. And then, even when you fail, it doesn't really matter, because you know that you've honestly tried. I also learned the difference between 'somehow trying' and giving it everything, and I think it is a very important distinction.

Where can we see your work?

My next show is in Delft in September. The details are on my website, *mariannekalsbeek.exto.nl*, where you can also see some of my work. Also, I recently hung a selection of my drawings at JOOT, a second-hand book dealer in Hartenstraat 15. Some of my best small drawings are there; you can go and have a look.

Reut Tsarfaty



Have you ever encountered a piece of research that you had thought to be extremely well-done, or elegant, or perhaps you even wished you had written it yourself? We asked the ILLC staff members Frank Veltman and Yde Venema to write about research that inspired them so much so that it influenced their professional interests and shaped their academic choices.

Old Loves Die Hard

What follows is my Top 3 List of 'Papers I Wish I Had Written'. All three appear on the Top 40 List of 'Classics in Formal Semantics and Pragmatics' published on my homepage (staff.science.uva.nl/~veltman/classics.htm), but they would not appear at the top of that list if I had to order it. For that, they would have to be more classic than Kripke's *Naming and Necessity*, Montague's *On the Nature of Certain Philosophical Entities*, or Lewis' *Counterfactuals*, and I do not think they are. But, as it happened, Kripke, Montague and Lewis[1] did not have such a direct impact on my life as the following three papers did.

Hans Kamp. Formal Properties of 'Now', 1971.

This is the first paper in which a clear distinction is drawn between context of utterance and context of reference. How important this distinction is did not become clear until much later in the work of David Kaplan and Bob Stalnaker.

I read this paper as a student in 1974 when I was studying philosophy and mathematics in Utrecht and writing my Master's thesis about context dependency. I remember how excited I was that one could actually *prove* that there are things one can say with indexicals (like 'now' and 'yesterday') that one cannot say with ordinary time phrases (like '9 o'clock on June 25th, 2005'). When I learned that the author was in fact a Dutch logician, I decided to ask him to become my supervisor for my PhD.

Greg Carlson. Reference to Kinds in English, 1977.

This is the best dissertation in formal semantics ever and still well worth reading for anyone who likes to marvel at the intricacies of natural language. Carlson presents an enormous amount of bewildering data on bare plurals and creates a beautiful order in this jungle. To me, raised by Else Barth as a kind of ideal language philosopher, distrusting all sorts of essentialist talk (like talk about 'natural kinds'), and used to papers with at most two examples ('The king of France is bald', and 'Necessarily the number of planets = 9', to be precise), the book came as a revelation. Now I knew what to do with the rest of my professional life: logical analysis of natural language.

It was not until the early '90s, when I wrote my paper on defaults, that I found something to say about bare plurals myself. But I would not have written that paper if I had not first learnt about dynamic predicate logic.

Jeroen Groenendijk and Martin Stokhof. Dynamic Predicate Logic, 1991.

I completely misunderstood this paper when I first read it. I just could not see how the formal definitions fit in with the informal explanations. So, at some point, I tried to write down the definitions myself. And that's how I discovered update semantics. By accident - or was it serendipity?

Frank Veltman

[1] Actually, Lewis' book on counterfactuals would end up in 4th place in this list here. My dissertation is just a long footnote to *Counterfactuals*.

Hans Kamp. Formal Properties of 'Now'. *Theoria*, pages. 227-273, 1971.

Greg Carlson. Reference to Kinds in English, Ph.D. Thesis, University of Massachusetts, Umass Graduate Linguistics Student Association, Amherst, Mass., 1977.

Jeroen Groenendijk and Martin Stokhof. Dynamic Predicate Logic. *Linguistics and Philosophy* (14):39-100, 1991.

Formulas, Automata and Models

Roughly ten years ago, and more or less simultaneously, I got acquainted with two lines of thought that have fascinated me ever since. While each of these bears considerable individual interest, taken together they changed my way of thinking about (modal) logic, its semantics, and its links with the neighboring field of automata theory.

The first idea originates with Larry Moss (Moss, 1999), but it has also been isolated and carried further by Alexandru Baltag (Baltag, 2000). It uses a reorganization of modal logic on the basis of a single 'cover modality', which may replace both the standard box and diamond of modal logic. Moss noticed that with this cover modality, which takes sets of formulas as input, the process of establishing the truth of a formula bears a striking resemblance to that of finding a (bi)simulation between language and structure. What underlies this resemblance mathematically is *relation lifting:* a natural way to construct a relation between sets of certain objects out of a more basic relation connecting the objects themselves. Now in the game theoretic approach, similarities between truth evaluation and model comparison had been observed before, but what makes Moss' *coalgebraic* approach so useful is that it provides these observations with a rigorous mathematical backbone.

Background to the second idea is the theory of finite automata, a well-established area of theoretical computer science which boasts seminal results such as the decidability theorems of Büchi and Rabin. Continuing tradition, Janin & Walukiewicz (Janin and Walukiewicz, 1995) came up with the notion of *μ-automata* as a tool for proving results, very powerful ones in fact, about the modal μ-calculus. This extension of modal logic is one of the most important formalisms for describing and reasoning about the ongoing behavior of programs. Lacking space for a meaningful description of μ-automata, let me just say that the criteria under which a μ-automaton accepts a given input structure or not are formulated in terms of an acceptance game. What links μ-automata to Moss' coalgebraic semantics is that this acceptance game involves the same kind of relation lifting as mentioned above.

If we combine these ideas, a picture emerges that to me looks very pretty. From the general theory of finite automata, we adopt the helpful perspective that there is no real difference between formulas and automata. A true revelation to me was the observation that both formulas and automata are also extremely similar to the models they are intended to describe. To be a bit more precise, automata carry a mathematical structure that naturally and uniformly *generalizes* that of models. The exact nature of this generalization is that a formula/automaton harbours many different versions of a model; the version that we are dealing with is not fixed, but locally and dynamically determined at 'run time' as the temporary outcome of an interaction between the two players of an acceptance game.

This picture is not only conceptually and esthetically appealing to me, it may also be of help to understand deep mathematical results and transport them to wider settings. For instance, one may show that Rabin's decidability theorem is based on the automata-theoretic result that arbitrary tree automata can be replaced with non-deterministic ones, and the latter result in its turn ultimately depends on a theorem in game theory stating that certain infinite two-player games enjoy a very special kind of determinacy. A further analysis then reveals that we may prove versions of these results in any kind of setting where the composition of two bisimulations is again a bisimulation. And finally, from these results one may derive, in a uniform way, many interesting consequences for the associated logics, concerning decidability but also uniform interpolation and other properties.

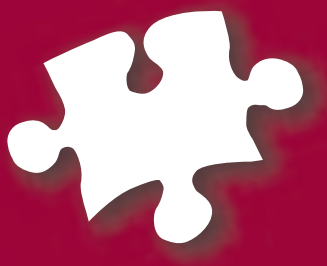
Yde Venema

A. Baltag. A logic for coalgebraic simulation. *Electronic Notes in Theoretical Computer Science*, pages 41-60, 2000.

D. Janin and I. Walukiewicz. Automata for the modal μ-calculus and related results. In *Proc. 20th International Symposium on Mathematical Foundations of Computer Science (MFCS'95)*, volume 969 of LNCS, pages 552-562, Berlin, 1995. Springer.

L. Moss. Coalgebraic logic. *Annals of Pure and Applied Logic,* (96):277-317, 1999.

Behind *the Scenes*



Everybody at the ILLC knows Marjan and Tanja. But how many of them are aware that Tanja is a biology graduate and that Marjan is passionate about horses? ILLC Magazine was curious to learn more about the two ladies behind the scenes.

Obviously, a research institute like the ILLC revolves around its research staff. However, the ILLC would be hard put if it didn't have Tanja Kassenaar and Marjan Veldhuisen to deal with all the practical arrangements for guests, PhD students and undergraduates - anything from organizing accommodations to sending a fax. Time to spill the beans on an ex-punker who writes short stories and a horse-lover who has finally found a good stable.

Tuesday morning is one of the rare moments when secretaries Tanja Kassenaar (age 41) and Marjan Veldhuisen (age 48) are both at their post. They operate from Room 3.29, the nerve centre of the ILLC. Marjan has been working there for six years, Tanja for three. Marjan: "We work at the hub of the institute. One of us is always here and we are a part in everything that happens."

Though they often have a general idea of what the research is about, they can't explain it in detail. And they don't have to. Tanja: "The staff members themselves often say that they don't understand each other's research, so that makes us feel better." Marjan sees the dissertations as 'works of art'. "I look at them as if they were paintings," she says.

They are enthusiastic about the researchers. The archetypal image of the absent-minded professor is definitely represented, but Marjan confesses that it does have a certain charm: "Some of them have a sort of endearing faraway look or they are a bit shy."

They were a bit indignant when they got the wrong impression that the interview would focus mainly on inside information. "What do you mean 'inside information'? I thought this interview was supposed to be about us," Marjan wrote in an e-mail.

Even so, after some discussion, they decide to reveal one snippet of gossip that was probably pretty obvious in any case. Both ladies had noticed that a small influx of female research assistants had led to some radical changes in the male bastion of the ILLC in recent years. Marjan: "The whole atmosphere changed. At long last the researchers emerged from their rooms and things livened up. They went off to lunch together - that hadn't happened in ages." The next question is whether they started acting more macho. Tanja: "No, the men around here aren't really 'macho' types."

So much for the gossip. After all, that wasn't the purpose of the interview. So, who exactly are Marjan Veldhuisen and Tanja Kassenaar?

'Writing Policy Documents Was the Best Part'

"I studied biology, went to creative writing classes, and now I'm a secretary. And I love it." Lack of ambition, especially in graduates, is often frowned upon, but Tanja Kassenaar has her own priorities: "My father worked for the PTT and wasn't very ambitious. He maintained that a good atmosphere was what mattered most. That goes for me too."

One of her duties is to make the necessary arrangements for foreign students. After all the e-mail communication, she really looks forward to meeting them.

"Sometimes they are so grateful that they bring me a present. A bit excessive, but nice all the same," she says. And she thrives on the excellent atmosphere at the institute. "The ILLC is simply a friendly place to be. I think that's important in a job."

Though she understands next to nothing about logic, Tanja still feels that she belongs. She finds it amusing that most of the research staff have viewed her differently since it leaked out that she had a degree as well.

Tanja did try to make a career for a while: "I spent three years as an environmental policy worker in Flevoland province, and often had to attend meetings," she says. "I didn't like that at all; I'm not looking for that much responsibility."

But the job was definitely in line with the ideals of her youth. In the early 1980s, Tanja, who was born and still lives in Amsterdam, was a punker and an environmental activist, who joined in protests against nuclear weapons and energy in Woensdrecht, Borssele and Dodewaard. And she was part of the squatters' movement. "Well, I wasn't exactly a squatter," she says. "But I was present at a squat a couple of times."

Environmental pollution was just then emerging as an important issue. Tanja: "I didn't have the nerve to take action, so I decided to do my bit in another way." She registered as a biology student to find out more about ecology and the environment, but her passion gradually ebbed. Now, it has more or less disappeared altogether and she wants nothing more to do with the movement: "The only thing I'm a member of now is Natuurmonumenten."

With just a hint of embarrassment, she tells us that the most enjoyable part of her job in provincial government was writing texts for policy documents. She loved writing so much (and still does) that she enrolled for classes at a creative writing school. Unfortunately, she couldn't complete the course because the school went out of business.

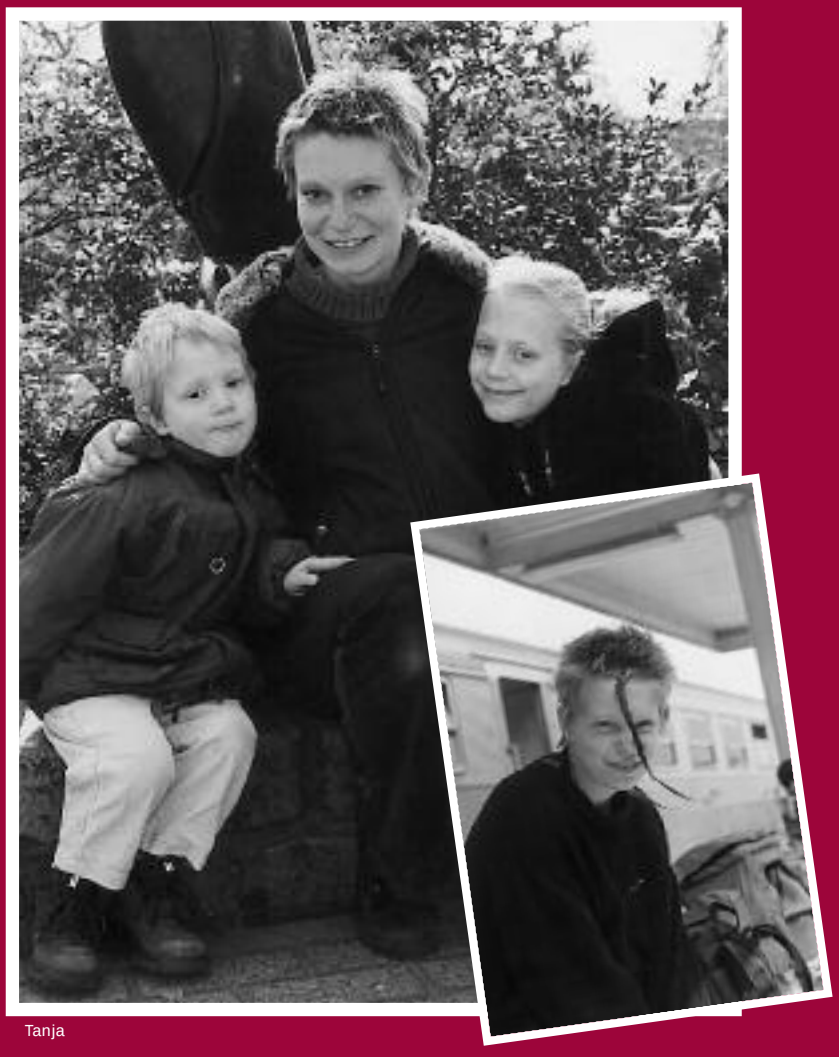
She wrote three stories that, according to her teachers, were worth publishing. Tanja: "But I had to rewrite them and I didn't fancy that much. I had already rewritten them several times before handing them in. I just wanted to be rid of them. Now, I could kick myself."

One of the stories was about a girl whose father had died. (Tanja: "It's less sentimental than it sounds.") Another was about two men in a graveyard, but she won't even hint at the theme: "Graveyards intrigue me. There's something magical about them." She hopes one day to write another story on the same theme. Tanja has been reading lots of books lately - including the Bible - and plans to buy a laptop so that she can write in other places besides her own home. She may not shout it from rooftops, but Tanja isn't entirely without ambition.

Contagious Enthusiasm

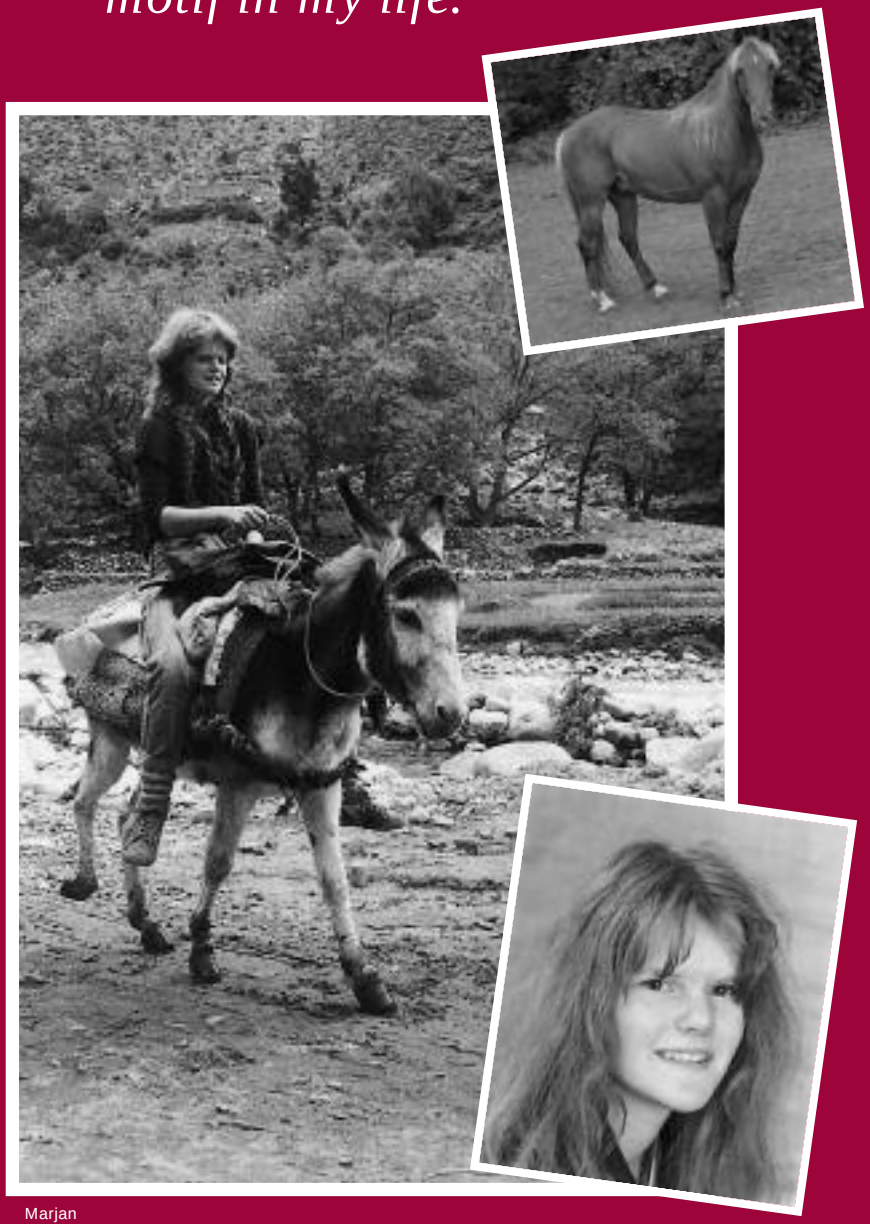
Waitress, receptionist, telephonist at directory inquiries (abroad),

'I studied biology, went to creative writing classes, and now I'm a secretary. And I love it.'



Tanja

'Horses are a sort of recurrent motif in my life.'



Marjan

secretary... Marjan Veldhuisen certainly has plenty of work experience. Often, she worked under a limited contract, as a 'temp' or on night duty, but she always took a couple of months off to travel. At the ILLC she finally found her niche. The main reason behind her travels, and the reason why they ended, is her love of horses. Marjan: "Horses are a sort of recurrent *motif* in my life."

Many times she has visited a horse farm in Provence in the South of France and also a ranch in the US state of Montana. Six months ago the visits stopped, because Marjan is now the proud owner of her very own horse, a Canadian mountain breed who is named Alf. Marjan: "It's a bit of a strange name but that was what he was called when I bought him. He is a bit like 'Alf', the alien on TV. He is so single-minded."

She spent part of her childhood far away from her hometown of Amsterdam: in Liberia, where her father had a job with a US oil corporation. "Sheer paradise," is how she describes it. She'd love to go back, but the country has been so torn apart by civil war that she's afraid she wouldn't recognize it anymore. "So, it's better to keep the memories intact," she says.

Though Marjan no longer spends months abroad, she hasn't entirely given up travelling. The past few winters she and her partner spent some time in Sri Lanka, a country they have both fallen in love with. Marjan: "Last year, we were scheduled to leave on December 28th, two days after the tsunami. My partner did go there later in January to help with the relief effort."

Marjan and her partner want to buy a plot of land for a few Sri Lankans who have lost everything. "The people living in the area we visit didn't get much help," she says. They plan to go back in the autumn to decide on the shape their project will take. The only problem is... the horse. Someone will have to take care of it. What's more, Marjan now has a permanent job, so she can't come and go as she pleases.

Like Tanja, Marjan enjoys her job. She loves the scope it gives her to develop initiative: "The UvA is a large, cumbersome organization where each faculty has its own culture. Often, you end up running from pillar to post without a clue about how to get some things done, like organizing a congress. I've worked out my own systems and written it all down for the sake of consistency. Sometimes I feel like a pioneer."

She also talks about a "warm and friendly working environment" where she hopes to grow old. The enthusiasm of the researchers is contagious and inspires her to do her job with equal enthusiasm: "I feel great if I manage to organize an attractive venue for a meeting instead of a grim conference hall. It's a good thing the researchers don't have to worry about practical matters. That's what we are here for."

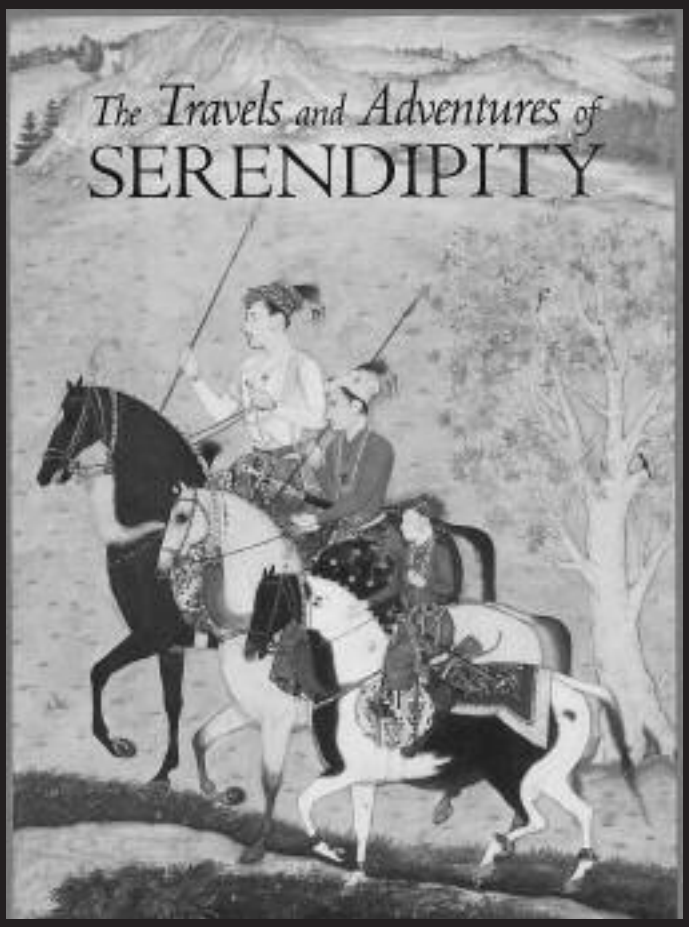
But life at the institute isn't a bed of roses. Marjan is a bit concerned about a pending reorganization, which will require the secretaries to work in another space, separate from the researchers. Marjan: "A bleak prospect that should be postponed for as long as possible."

Olivier van Beemen

With every great discovery comes the story of how it came about. Typically, these stories involve an element of serendipity-an unexpected and beautiful insight clears the well-hidden path to wisdom. The ILLC Magazine invited the world's leading expert on the subject of serendipity, Pek van Andel, to write about logic and serendipity. Moreover, two of ILLC's own researchers were asked about their own serendipitous experiences.

The Logic of Serendipity

Pek van Andel



Merton & Barber: The travels and adventures of serendipity, 2004

The word *serendipity* was coined by Horace Walpole in a letter from 1754. His inspiration came from the tales contained in 'The Three Princes of Serendip' - Serendip being the ancient name of Ceylon (Sri Lanka) - that told of the (mis)adventures of the said three princes. In Walpole's words, "[they] were always making discoveries, by accident and sagacity, of things they were not in quest of." Walpole referred to the following tale as an illustration:

Once upon a time, the King of Serendip had three sons who, after receiving a superb education, declined to succeed him. The three princes began to travel and one day, they walked alongside the tracks of a camel. The eldest brother noticed that the less verdant grass on the left-hand side of the tracks had been eaten, while the greener grass on the right-hand side was left undisturbed. He concluded that the camel's right eye was blind. The middle brother observed many lumps of chewed grass which were roughly the same size as a camel's tooth, giving him the idea the camel might be missing a tooth. The tracks were peculiar as well-prints were left by only three feet, the fourth apparently being dragged. From this, the youngest brother inferred that the camel was crippled. The eldest brother also noticed on one side of the track a stream of ants consuming something and, on the other side, a vast mass of bees nibbling a transparent, sticky stuff.

He gathered that the camel had been loaded with butter, which when melted had attracted the ants, and honey, attracting the bees. The second brother saw traces indicating that the animal had kneeled and found marks of human feet and a wet spot. He touched it with his fingers and, even before smelling them, felt a carnal temptation. He concluded that the camel must have carried a woman. The third brother further noticed handprints on both sides of the place where she had watered. The woman had supported herself because of the size of her body and might be pregnant, he thought.

Later, the three brothers met a camel driver, who was missing one of his animals. Since they had observed so many signs, they joked that they had seen the camel and to make it credible they mentioned the seven marks, all of which appeared correct. Eventually accused of theft, the brothers were put in jail, but when the unharmed camel was found, they were released. Walpole considered the princes' discovery of the camel to exemplify "accidental sagacity", specifying that "no thing you are looking for comes under this description".

R.K. Merton, sociologist of science, published in 1948 on how unanticipated, anomalous and strategic empirical facts aid in the initiation of a theory: the serendipity pattern refers to the fairly common experience of observing an *unanticipated, anomalous and strategic datum*, which becomes the occasion for developing a new theory or for extending an existing theory.

The datum is, first of all, *unanticipated*. Research directed towards the test of one hypothesis yields a fortuitous by-product, an unexpected observation, which bears upon theories not in question when the research was begun. Secondly, the observation is *anomalous*, or surprising, either because it appears inconsistent with the prevailing theory or with other established facts. In either case, the seeming inconsistency provokes curiosity; it stimulates the investigator to 'make sense of the datum', to fit it into a broader frame of knowledge. Thirdly, in noting that the unexpected fact must be *strategic*, i.e., that it must permit of implications which bear upon generalized theory, we are, of course, referring to what the observer brings to the datum rather than to the datum itself. For it obviously requires an observer sensitive to theory to detect the universal in the particular.

1733), an Italian Jesuit logician, found what he was not in quest of: a non-Euclidean geometry (as it is called now). He didn't realize this, for he believed piously that Euclid's was the only true geometry. But after him, another mathematician realized what Saccheri had discovered. Serendipity is a correct abduction (explanation) of a surprising observation, as an 'accidental' finding, that 'falls' to you (*ad-cidere* is Latin for 'to fall to', viz. to the observer). It is arrogant to think that 'God's will', a conscious or unconscious mind, a plan, a policy, a tactic, a strategy, a stratagem, an ideology, a research-proposal or -project, a program, an expert system or research-financer, could intentionally anticipate unknown, unforeseeable, unpredictable, counter-intuitive, surprising facts or relations. That is, by definition and logically, impossible. A computer program cannot foresee or operationalize the unforeseen and can thus not improvise (*imprévu* (French) = unforeseen). It cannot be surprised, astonished or brilliant, and has no curiosity, sense or intelligence for anomaly, humor, paradox, contradiction, oddity, surprise, originality or the unexpected in general. And it never discovers something new. Why not?

'An invention worthy of being patented is described by law as something surprising.'

My collection of serendipitous discoveries, inventions and creations in science, technology and art is now, as far as I know, the largest in the world. It consists of serendipities and pseudoserendipities. The term pseudoserendipity was coined in 1989 by the American chemist R.M. Roberts 'for accidental discoveries of ways to achieve an end sought for, in contrast to the meaning of (true) serendipity which describes accidental discoveries of things not sought for'.

In this 'chaos' of unsought findings (true serendipities), I discovered 'order' in the form of thirty serendipity patterns. My list of patterns is not a classification, but it introduces a new and stimulating perspective on the old subject of serendipity. Knowledge of these patterns of serendipity may also help in finding the unsought and in expecting even the unexpected.

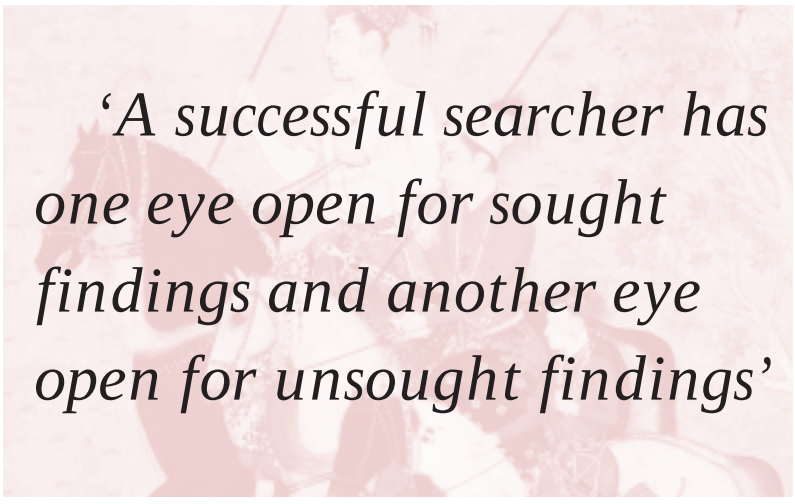
I give here just one pattern: one person discovers something surprising and another interprets it correctly as something new. For example, Giovanni Saccheri (1667-

To discover something really new, you cannot go logically from the old to the new or from the known to the unknown. If you should be able to do so, the result wouldn't be really unknown or new. To discover something totally new, you also

need an unpredictable element, often a surprising observation followed by a correct abduction. An invention worthy of being patented, for example, is described by law as something surprising, that didn't just logically evolve from the known or the old. A real discovery, invention, creation or thought can never be derived purely logically from the old, nor is it purely stochastic, it is always a combination of an unforeseen observation or thought and logical thinking. Directed search and serendipity do not exclude each other, but rather they complement and even reinforce each other. A new finding is seldom made purely by design or by accident. Mostly, it is by accident and by design.

In my view, a scientific investigator needs academic freedom to walk, limp, stumble, jump and dance on both legs-one to test hypotheses and the other to explain the anomalies that sometimes emerge in doing so. But not every anomaly emerges during the test of a hypothesis and not every fresh hypothesis starts out as an explanation of an anomaly. Further, the test of a hypothesis does not always provide an anomaly, and an anomaly does not always provide an original hypothesis.

In general, the role of serendipity in science, technology and art is underestimated. This is mainly and unintentionally caused by the way we rationalize *a posteriori* about theoretical and experimental research and its results, when we publish it (as 'retrospective falsification or prophecy'). The not strictly rational, logical, chronological, or searched components (like chance, *fortuna*, accident, error, humor, surprise, unsought, (n)ever thought or dreamt of, unknown, etc.), which have also led to these results are therefore underestimated and sometimes even banned from the theater and totally hidden behind the decor. The next step is that pure logic becomes the norm, not only regarding the result, but also regarding the road that led to it (*met'hodos* (Greek) = the way along which). Life can only be understood backwards, but must be lived forwards, as Kierkegaard wrote. A scientist then reports her result as following directly and logically from her initial hypothesis, omitting possibly crucial serendipitous happenings. She writes her article in such a way that the reader, when he wants to, can redo the search, can *re*search it, to see whether its results are reproducible. It is quite rational and efficient to write articles that way. But reading and interpreting articles of the 'how-it-really-happened' genre about a finding, can brainwash the reader in such a way and to such an extent that he neglects during his own search the flowers along the road that can form a nicer bouquet than those he is looking for. This can cause a loss of serendipity. Then the aim and the plan can spoil the journey. A successful searcher has one eye open for sought findings and another eye open for unsought findings. Planning is a must, but a plan is never sacrosanct.



We are still educated with the idea that knowledge grows from question to answer. Also, the examination of knowledge is done mostly with a previously known and correctly formulated question with pre-formulated answers, from which always just one is correct. (*Multiple choice* is a misnomer: it is a *single choice*). This tradition of examination can unintentionally give the idea that also in original scientific research knowledge grows from correct questions to correct answers. But in original investigation neither the good question nor the good answer are given beforehand (nor their existence nor the possibility of finding them). Practice and theory teach us that regarding serendipitous observations on the road from question to answer takes us in the opposite direction: from a surprising observation to a new question (viz. a fresh hypothesis). The way we are schooled, trained and examined does not teach us explicitly to find and formulate for ourselves good questions and correct answers. A student is not educated or trained to make observations of the unexpected and to interpret them correctly. Have you ever heard of lab sessions in which - unannounced - unexpected phenomena emerge to test whether the student doing the lab work observed them, and if so, what he did with them? I still remember myself asking many exam questions that I couldn't answer. Therefore, I think, it is doubly instructive to let students miss unexpected observations, and to grind their nose in it: to try to make them more 'serendipity prone'!

Serendipity has been described by an anonymous sexist as 'looking for a needle in a haystack and rolling out with the farmer's daughter'. The logic for 'serendipity at work' is, as Hamlet said: 'The readiness is all!'

Pek van Andel,
m.v.van.andel@med.umcg.nl

Pek van Andel, 'Anatomy of Serendipity', *BJPS*, 1994 (631-648)

The Importance of Dreckeffekts

Serendipity is everywhere in science. Without serendipity there would be very few discoveries, if any at all. Perhaps that's why I always have a hard time filling in the sections on "Expected Results" in NWO project proposals. The "Expected Results" of a project are not known beforehand-they are unexpected, indeed, serendipitous.

Certainly, the really hard problem is to recognize a serendipitous discovery as such. Many uninteresting events or "Dreckeffekts" can later turn out to be interesting. In my own work, I noticed this with respect to the good old DOP model, known as DOP1. There appeared to be an annoying side-effect: as soon as the productive units of the model got larger than simple context-free rules, there were several derivations that produced the same parse tree. Initially, I was annoyed by all these spurious derivations, so I focused on the most probable derivation only. But all at once, after weeks of trial and error, I saw that all these different derivations contributed to a better estimation of the correct parse tree, which led to an entirely different view on the notion of parse tree probability. This made DOP truly unique and has so far been unsurpassed by other parsing models.

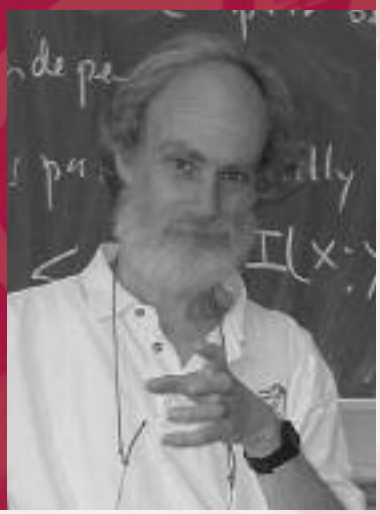
How could I ever have foreseen this result when I started my PhD research? I was only brought to it by endlessly "playing" with many preliminary models, investigating their properties, and trying out different probability models. I "played" with it during the daytime, during large parts of the night, during a full holiday vacation, on the beach, and then, at once, without knowing why, I saw that the Dreckeffekt was a major advantage.

Thus we should urge NWO to change the title of the section "Expected Results" in research proposals to "Unexpected Results". That would be far more interesting for all parties.

Rens Bod

The Mirror on the Beach

Back in 1971, I regularly spent weekends hiking 10 km. from Egmond to Bergen aan Zee, thinking about mathematics. I had just dropped Algebraic Geometry, exchanging it for Abstract Complexity Theory - an unknown topic in Theoretical Computer Science, recently developed in the USA.



I was trying to generalize the existing theory of abstract complexity classes for *weak classes* where non-terminating computations don't violate a complexity bound. For most results, like the Compression Theorem, the Gap Theorem, and the Union Theorem, the generalization worked, but not for the notorious McCreight-Meyer Naming Theorem. This result constructs a renaming of the family of complexity classes C_{t_i} by a *measured set*, a sequence of functions f_i for which the predicate $f_i(x) = y$ is recursive. *Renaming* means that enforcing complexity bound t_i captures the same programs as bound f_i.

Walking on the beach, playing with the Recursion Theorem, I discovered the *Mirror Lemma*. Take fixed complexity bounds $g(x) \leq h(x)$; for every measured renaming t_i to f_i, there exists an index i such that $t_i(x) = 0$ or $t_i(x) = h(x)$, while $t_i(x) = 0$ iff $f_i(x) > g(x)$. This function $t_i(x)$ is *reflected* in $g(x)$ by the renaming.

This lemma caused a complete reversal of my research plan. It shows that weak classes can't be renamed by measured transformations, so the theories for strong and weak complexity classes are essentially different. For details, I refer the reader to my paper, *The Non-renameability of Honesty Classes* in Computing, Arch. Elektr. Rechnen, vol. 14 (1975), 183-193.

This observation turned an unpromising generalization exercise into PhD research, producing a thesis, which led to my prolonged residence at this university, which, in turn, was instrumental for developing the scientific climate from which the ILLC originated. Hence, one could claim that the ILLC was found in a mirror on the beach at Egmond aan Zee.

Peter van Emde Boas

New PhD students

New PhD students

Name, age Chantal Bax, 26.
Where are you from? I'm from the Netherlands.
What's your background? I have a background in philosophy; in metaphysics, to be precise.
What's your research topic? The provisional title of my project is "Subjectivity after Wittgenstein: religion, aesthetics, politics". That should speak for itself.
Who are your supervisors? Martin Stokhof and Michiel van Lambalgen.
Preferred study spot? Room 208, Vendelstraat 8
Favorite bar in Amsterdam? Anywhere my friends are.
Do you like raw herring? Yes!
Do you believe P=NP? As an agnostic I can neither answer 'Yes' nor 'No'.
Does John love Mary? The John I know doesn't.

Name, age Fenrong Liu, 30
Where are you from? Beijing, China.
What's your background? I studied philosophy at my university in China. Getting sick of some of the arguments philosophers used to convince people, I began looking into logic and tried to find a better, or more precise, way to prove things.
What's your research topic? My research topic is "logic, games, and social behavior". I would like to investigate the dynamic process of games: how players update their knowledge and revise their beliefs.
Who are your supervisors? Johan van Benthem.
Preferred study spot? ILLC, of course. Otherwise...
Favorite bar in Amsterdam? I will try more of them before I answer this question.
Do you like raw herring? Not really.
Do you believe P=NP? Yes, I do.
Does John love Mary? You never know.

Name, age Ka-Wo Chan, 29
Where are you from? Hong Kong, China.
What's your background? I read maths in Hong Kong and earned my BSc and MPhil degrees there. Frankly, I did nothing related to logic in Hong Kong as there were no people working in the field. Since I was (and am!) fond of logic, I then left for the UK to read for an MSc degree in logic. Afterwards, I went back to Hong Kong and worked. I joined ILLC beginning last September.
What's your research topic? I haven't decided yet, but it will be in the field of modal logic.
Who are your supervisors? Yde Venema is my adviser for the moment.
Preferred study spot? My apartment, or the library, in case I need to look for books.
Favorite bar in Amsterdam? I don't go to bars very often, so I couldn't tell you my answer.
Do you like raw herring? I always say ``nee" to raw meat.
Do you believe P = NP? I'm not an expert on this problem, so I won't say anything here. But I know that many people believe it.
Does John love Mary? ``John loves Mary" is true iff John loves Mary.

Name, age Olivier Roy, 26
Where are you from? Quebec, Canada.
What's your background? Master's in Philosophy
What's your research topic? Interaction between game theory, dynamic logic and philosophical theories of intention and planning.
Who are your supervisors? Johan van Benthem
Preferred study spot? Coffee Company on the corner of Kinkerstraat and Jan Pieter Heljestraat. I recommend the double espresso!
Favorite bar in Amsterdam? For the crowd: Kriterion. For the drinks: De Zotte.
Do you like raw herring? Ja, lekker!
Do you believe P=NP? No. The proof is left as an exercise to the reader.
Does John love Mary? Depends on the model.

Name, age Reut Tsarfaty, 30
Where are you from? I was born in London to Israeli parents and grew up in Israel.
What's your background? I completed a B.Sc. in `Information Systems Engineering' in the computer science department of the Technion, Israel Institute of Technology. During and after my undergraduate studies, I was employed by Intel. In September, 2003, I joined the `Master of Logic' program at the ILLC to further pursue logic and computation, during which I found out that I am most interested in language...
What's your research topic? I am interested in computational and theoretical linguistics and currently working on semitic languages and in particular Modern Hebrew.
Who are your supervisors? Prof. Remko Scha and Dr. Khalil Simaan.
Preferred study spot? The kitchen in the basement of my parents' house in Modi'in.
Favorite bar in Amsterdam? Cafe Sarphaat, near Sarphati park (no family relations)
Do you like raw herring? No. (I do not eat anything that comes out of the sea.)
Do you believe P=NP? They are certainly different if they are labels in syntactic parse trees.
Does John love Mary? Define "love"...

Name, age Stefan Bold, 34
Where are you from? Bonn, Germany
What's your background? I got my 'Diplom' (Master degree) in Mathematics from the University of Bonn. I am now working on my PhD thesis here at the ILLC. So I am a mathematical logician, deeply rooted in Set Theory.
What's your research topic? Infinite combinatorics, mainly under the Axiom of Determinacy, i.e., the assumption that in all infinite perfect information games on the natural numbers one of the players has a wining strategy.
Who are your supervisors? Benedikt Loewe
Preferred study spot? Any place with sun, sea and palm trees. If that is not possible, any place with coffee.
Favorite bar in Amsterdam? The Dim Sum House in the Zeedijk, not a bar, but nice food. And the East of Eden, if it has to be a bar.
Do you like raw herring? Absolutely. With diced onion.
Do you believe P=NP? Depends on the definition of 'P','NP' and '='. Everything is true, for a certain value of 'true'.
Does John love Mary? I really don't know, but I wish those two the best.

Name Tine Wilde
Promoter Martin Stokhof

www.tinewilde.com
www.illc.uva.nl/hum/corrido(o)r
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The Next Generation of the ILLC

Photographer: Yanjing Wang