What's Music Got to Do With It?

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machines, what music cognition research is all about and what the ILLC has got to do with it.

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allows us to make music collaboratively. Interestingly, chimpanzees do not have this talent. Beat induction was one of the central topics of the two-year research project 'Music, Mind, Machine' (MMM), a research project that finished about three years ago (does 2002/2003 ring a bell?). In this project we further developed a methodology of computational modeling for music research. A somewhat overexposed visualization of that research was the *mechanical shoe*: a contraption that, when

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Have you ever encountered a piece of research which is so interesting, well-written or elegant that you wished you had written it yourself? Or perhaps you appreciated it but thought it was in need of improvement? Often there are the pieces which set us off on our academic path. As in last year's issue, we put three questions to two senior ILLC staff members. This year, Anne Troelstra and Martin Stokhof tell us about research which has had a decisive influence on their academic careers.

Inspiring research:

Through Darkness to the Light

As a graduate student, I heard about L.E.J. Brouwer's intuitionism. This was fascinating: an alternative way of looking at mathematics, resulting in a deviant mathematical practice. The idea of mathematics as the study of mental constructs, which made mathematics somehow more direct and concrete to me, held great appeal. There was an obvious way of learning more about this topic: following Arend Heyting's courses and buying his book *Intuitionism, an Introduction*, the first edition of which had appeared in 1957.

It was a good thing that I got my introduction to the subject this way; if I would have tried to study Brouwer's own papers first, I might well have been put off the subject forever. Heyting's book, on the

other hand, was a masterpiece of clear exposition. The most intriguing topic in the whole book was choice sequences and their properties; this had no obvious parallel in classical mathematics. But it was there as well where I had some real conceptual difficulties. The so-called fan theorem (classically, this just amounts to the compactness of the Cantor discontinuum) was motivated by an argument, due to Brouwer, in which it was stated that all *intuitionistic proofs* of statements of a certain form must have a certain 'canonical' form. This statement - though more or less plausible - came out of the blue. I still suspect that Heyting himself never felt quite at ease with this particular argument.

Then Heyting lent me the *Stanford Report on the Foundations of Analysis* - essentially a collection of preprints - and I found there a paper by G. Kreisel in which the choice sequences, including the puzzling argument concerning the fan theorem, were systematically explained away. This was done translating statements involving quantification over choice sequences into statements not involving choice sequences. The basic idea of the paper was simple and brilliant: taking Brouwer's informal descriptions and remarks about the nature of choice sequences seriously, obtain from this enough information to make the translation work.

So where there was a chance to obtain a stipend to study abroad,

I choose Stanford, Kreisel's base, as the place to go to. There I started an in-depth analysis of Kreisel's paper, baffled by what seemed at first a mere technical difficulty, but which turned in fact a conceptual mistake leading to not quite the right axioms for choice sequences; and I ended up writing a very long joint paper with Kreisel. This started me in earnest on a career as a logician. Summing up, this was the result of reading an inspiring book and a brilliant paper. They stimulated me; but ultimately, it has been their defects which led to my own contribution.

Anne S. Troelstra

Dear ILLC-friend,

Where are we going; and how did we get here? In this issue of the ILLC magazine we reflect on both of these questions. We speak to a number of ILLCers who are taking research in new directions: Henkjan Honing and his group tell us about music cognition research at the ILLC and alumnus Marc Pauly explains the potential of logic for real-world applications in the field of social choice. Looking back, Hugo Brandt Corstius gives his opinion about the not-so-new application of logic to language analysis. Continuing the feature we started last year, senior ILLC members Anne Troelstra and Martin Stokhof tell us about research which inspired them along the path of their own research careers. Finally, as in previous issues, we are happy to introduce the new Ph.D. students and, for the first time, the new staff members also get to say hello.

Reflections aside and onto a key theme at the ILLC: *logic and games*. We at the magazine would like to contribute to the exploration of this actively growing field of research at the ILLC with a new project on the topic: a puzzles page! To encourage you to join us in this exploration, the ILLC bureau will award a prize to the first reader who mails in the correct answers.

We would like to thank all those who contributed to this issue and we hope that all our readers enjoy the articles and images we've gathered here for you.

The editors,
Marian, Merlijn and Reut

Announcements

Projects and awards

• The research proposal of Yde Venema, titled "Algebra and Coalgebra: The Mathematical Environment of Modal Logic", has been selected for the VICI award by the NWO Exacte Wetenschappen. He was awarded the sum of 1.43 million euros for his project consisting of 3 PhD students and 2 postdocs.
• The project proposal for GloRiClass, "Games in Logic: Reaching Out to Classical Game Theory", with Benedikt Löwe as its main applicant, was awarded a grant of 1.25 million euros by the Marie Curie program of the EU, which covers the costs of 8 PhD students.
• In the framework of Programmatisch onderzoek, NWO Geesteswetenschappen, ILLC colleague Wolfram Hinzen was awarded funding for his project "Origins of Truth and the Sentence". The subsidy amounts to 375.568 euros for the appointment of a PhD student and a postdoc.
• Henkjan Honing EmCAP, "Emergent Cognition through Active Perception", is an EU research project in the field of Music Cognition awarded to Henkjan Honing. It covers the salary and other costs of 1 postdoctoral researcher and 0.5 PhD students up to

323.000 euros. The project started in October 2005 and will finish by September 2008.
• MuSeUM, "Multiple-Collection Searching Using Metadata", is a project awarded to Jaap Kamps within the CATCH program of NWO. He will receive funding of almost 545.000 euros to appoint a postdoctoral researcher, a PhD student and a scientific programmer.
• NWO Open Competitie: "Effective Focused Retrieval Techniques" by Jaap Kamps; one PhD student.
• NWO Open Competitie: "Theoretical and Algorithmic Complexity; Tresholds in Computer Games" by Johan van Benthem and Jaap van den Herik (Maastricht): two PhD students (one at the ILLC).
• NWO Rubicon Grant: Sujuta Ghosh from India was awarded a grant which funds a 1-year appointment as a postdoc at the ILLC, starting August 1.
• NWO Rubicon Grant: Troy Lee, former PhD student of Harry Buhrman, was awarded a grant which he will use to do research at the Université de Paris.
• Boudewijn de Bruin receives Praemium Erasmianum Research Prize: The Praemium Erasmianum Foundation awards each year a maximum

of five prizes with a value of 3000 euros in recognition of extraordinary dissertations from young scholarly researchers in the humanities.

Personnel Left
• As of September 1, 2005, Maricarmen Martinez Baldares finished her temporary teaching position and has returned to Bogota.
• Astrid Kramer left ILLC on February 1, 2006 to work for the Facilitair Centrum.

Graduated
• 1 June 2005: Rosja Mastop with "What can you do? Imperative mood in semantic theory", promotors : Frank Veltman and Martin Stokhof
• 11 January 2006: Troy Lee with "Kolmogorov Complexity and Formula Size Lower Bounds", promotor Harry Buhrman
• 23 March 2006: Clemens Kupke with "Finitary Coalgebraic Logics", promotor Jan Rutten (VU)
• 17 March 2006: Nick Bezhanishvili with "Lattices of Intermediate and Cylindric Modal Logics", promotor: Dick de Jongh

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Beat induction was one of the central topics of the NWO-PIONIER project 'Music, Mind, Machine' (MMM), a research project that finished about three years ago (dare.uva.nl/en/record/117783). In this project we further developed a methodology of computational modeling for music research. A somewhat overexposed visualization of that research was the *mechanical shoe*: a contraption that, when

Henkjan Honing: Nowadays, it is clear that music is a worthwhile domain for studying cognitive phenomena including representation, memory, attention, expectancy and emotion.

connected to a computer model, taps to the beat of the music, allowing for comparison with what humans would do.

Music as a domain of research gets a fair amount of attention, for instance, in high-impact journals. Until recently it was unclear in which ways music could illuminate fundamental issues in cognition. Nowadays, it is clear that it is a worthwhile domain for studying cognitive phenomena including representation, memory, attention, expectancy and emotion, and I'm sure it will become an important subject area in the cognitive sciences alongside vision and language.

Giving Music the Place It Deserves

HH: After the MMM project finished, I had to make an important decision: to continue the research abroad by accepting a professorship elsewhere, to do a restart in the Netherlands and form a new group from scratch, or, but

this was quickly rejected, to start a small restaurant. I chose the second option and spent the major part of 2003/04 on writing research proposals, and lectured a lot—to all who wanted to hear it—on music cognition. It resulted in receiving two large grants: one from the Dutch Science Foundation (NWO 'Foundations of the Humanities' programme) and one from the European Commission (Sixth Framework FP6/IST Programme), both in the field of music cognition. This is when Olivia Ladinig and Leigh M. Smith came to join the team. They started in the winter of 2005, and now, barely five months later, it already feels like a real group. A dream coming true.

Our research focuses on the temporal aspects of music, such as rhythm, timing and tempo, using theoretical, empirical and computational methods. Some recent research topics include the relation between human movement and the use of timing in music performance (can elementary mechanics explain timing patterns found in music performance?), rhythmic complexity (what makes one rhythm sound more exciting than another?), the relation between rhythm production and perception (can the differences between rhythm production and perception be understood in a Bayesian way?), a large-scale listening study on timing in music (is timing indeed independent of tempo as some models suggest and what is the role of expertise and exposure?), and the modeling of rhythmic expectancy (how do rhythmic expectancies emerge when being exposed to different types of music?).

My personal goal—it actually feels more like a mission—is to give music the place in scientific research that it deserves. While music was mostly studied in the humanities (i.e., music in its cultural and historical context), in the last two decades an important reorientation has occurred: a small-scale 'cognitive revolution' in music materialized in the margins of psychology, computer science and the humanities. Our group is in the middle of this interdisciplinary challenge.

Music, Language and Computation

HH: While our group is relatively new, there has been a long-standing working relationship with the ILLC. I started in 1992 at the UvA as a KNAW research fellow in the group of Remko Scha, who was later also a board member of the MMM project and who is currently in charge of the Language and Computation group. With Rens Bod and Menno van Zaanen, I worked on a DOP alternative to the beat induction models mentioned earlier. Bayesian modeling is a recurring topic in this work, one that I hope we can further expand upon in collaborations with other ILLC researchers, including Remko Scha and Khalil Sima'an. Next to these concrete ideas, topics like, for example, evolution and music are too intriguing not to explore in future collaborative projects.

I see the role of our research best subsumed under the last two letters in ILLC: language and computation. Like most topics studied at the ILLC, music cognition is characterized by being

Leigh M. Smith: Music is a universal, non-verbal form of communication as prevalent and varied as language.

essentially interdisciplinary—bridging methodologies and philosophical constraints from the humanities with those from psychology and computer science. Language was and will stay a good domain to compare and contrast findings from music. Both domains struggle with modeling their symbolic and sub-symbolic aspects and both are uniquely human phenomena worthy of serious research effort. The main difference is that music research is still lagging behind in terms of research effort.

Leigh M. Smith: I've found the ILLC to have a very refreshing and encouraging approach to music research. As collaborators, the people working in music, including Aline Honingh, Olivia and Henkjan, bring a wonderful diversity of experience and skills which really help broaden and improve the research.

A focused atmosphere can be inspiring even if there is not direct collaboration between the research projects. At a more general level, problem-solving approaches, programming languages and computational modeling methods can be held in common. A key issue which arises in music cognition modeling is representation—particularly evaluating the adequacy of a representation with respect to empirical results and the expressiveness of a representation in then synthesizing predicted outcomes. This issue is something that most modeling endeavors face and therefore working in an institute with people facing such problems and solving them with a wide variety of methods provides inspiration, metaphors and in some cases potentially directly applicable ideas.

Olivia Ladinig: A great benefit for my research is the flexibility for new ideas in the ILLC. Since the institute is located within the humanities as well as the faculty of science, one is not forced to principally decide between computational, theoretical or empirical accounts. You are required to find your own way through different, yet equally legitimate, viewpoints to consider issues in your research.

Olivia Ladinig:

As a music lover you could probably not think of a greater job.

My goal in this research is to combine psychological and formal thinking. Since my academic background is in cognitive and general psychology (as opposed to clinical or personality psychology which has its focus on differences between humans), my main focus lies in commonalities and regularities which most of us humans share. For these kinds of generalisations, it is very useful to use a certain degree of formalized abstraction in psychological theories.

Imagine What a Listening Machine Would Be Like...

LS: Music is a universal, non-verbal form of communication as prevalent and varied as language. It shares aspects with human spoken languages and at the same time has its own unique qualities as a form of communication. Unlike spoken language, there is no direct semantic relationship to other objects, so meaning in music instead develops by reference between musical events. I'm interested and challenged by this self-reference which spans musical elements across the dimensions of time, pitch, timbre or dynamics.

OL: I think few question the excitement and pleasure due to

research in music, since this strange auditory phenomenon is an important entity and companion in many people's lives. As a music lover you could probably not think of a greater job. One nice thing for me is that, although music in general seems to be something you cannot describe easily with words (which is maybe the reason why some associate something paranormal or esoteric with music research), it seems always possible to communicate with people from various different backgrounds about this kind of research. You can scale the level down to communicate with people who were never in touch with any scientific activity, but you can also discuss methods and details with experts in completely different scientific domains.

HH: When I explain to a more general audience that one of the foreseen applications of our European research project is to be able to make a *listening machine*, i.e., a machine that can listen and react in a human and musical way, people often react with saying, "Oh, so you actually want to replace a musician by a computer?" However, we are actually interested in what the machine cannot do: that is, what we cannot put in formal terms is not yet really understood. And this is what makes cognition such an intriguing domain.

Reut Tsarfaty

Logic In and Around the World

An interview with ILLC alumnus Marc Pauly

Continuing the tradition of alumni interviews, we caught up with one of the original Master of Logic students, Marc Pauly. Marc has followed his interest in logic beyond Amsterdam to such varied places as Liverpool, Toulouse and Stanford. As one of the first editors of the ILLC magazine, Marc conducted alumni interviews. Now it's his turn to tell us about his experiences of logic in and around the world.

Marc Pauly was a Master of Logic student in the second year of the programme's existence and went on to become a Ph.D. student here in Amsterdam. His dissertation, titled "Logic for Social Software", has become a touchstone for students at the ILLC working in this area. Marc has gone on to a thriving career in logic and has recently been appointed Assistant Professor in Philosophy at Stanford University. This is the completion of a circle for Marc, who grew up in Germany but obtained his undergraduate degree in the Symbolic Systems Program at Stanford.

Marc, when did you first get interested in logic?

I had to take a logic course as part of my undergraduate major. At the time, I thought that logic was the most foundational thing one could study, underlying all argumentation and hence all forms of rational inquiry. I think I also thought of it as the secure rock in the sea of life's (intellectual) uncertainties. Now, I don't think of it that way anymore. I still think logic is foundational in the sense that it provides the foundation of much of philosophy, as well as computer science, mathematics and part of linguistics. But I don't see logic as a secure rock anymore, given the multitude of logics and the foundational debates in the philosophy of logic. Fortunately, on the other hand, I am also less bothered by life's intellectual uncertainties. I'm more attracted by mathematical elegance and applicability, especially when they come together—the rare exception. I guess the difference can be described by the title of a nice book I read recently which describes the development of Wittgenstein's philosophy, it's called "Stil statt Wahrheit", style instead of truth.

So you read Wittgenstein, too! You must be a product of the ILLC. How did you find your way there?

When I was an undergraduate at Stanford, I met Johan van Benthem, who teaches there one quarter per year. He told me about the Master of Logic program. I was a MoL student at the ILLC from 1996 to 1997. I think this was the second year of the existence of the programme, and besides me there was only Brian Semmes, who as you know has returned to the ILLC. We were pioneers—or guinea pigs, if you prefer. Because of this I still catch myself being somewhat possessive of the ILLC, thinking of it as MY institute.

And then you left… and went around the world. You've worked in Liverpool, Toulouse and now Stanford. What kinds of experiences have you had in this time?

Toulouse and Liverpool were in many ways each other's opposite.

"We were pioneers—or guinea pigs, if you prefer."

The weather, to begin with, but also the way an academic department is run. France prides itself on its democratic tradition and there are complicated social choice mechanisms at work in order to determine, for instance, who gets hired for a job or what new policy to implement for the institute. At Liverpool, the head of the department has a lot more power to decide things by himself, so there's less voting. The problem with the French system is that the social mechanisms are so intertwined and numerous that the final result often seems like a random event. Even worse, when things go wrong, you have nobody to blame, since there were at least a dozen different committees involved in the decision making! So things tend to stay the way they are.

Social choice mechanisms: that's just your thing! You must have had a field day in Toulouse. Seriously, your research focuses on social choice theory. Tell us how you got there and what logic's got to do with it.

For my Ph.D. thesis, I investigated links between modal logic and game theory, trying to generalize logics for reasoning about programs to logics for reasoning about games, so-called game logics. And from game theory, it is only a small step to social choice theory. One of my initial puzzlements was that social choice theorists think about logic in a very different way from the logician. For me the crucial point is that logic investigates formal axiomatic languages, something that most social choice theorists do not care about, or at least not yet. I think the development is somewhat parallel to the situation in the foundations of mathematics, where meta-mathematics, the work of Tarski, Gödel and others was a relatively recent development. So I hope that social choice theory will

similarly generate a branch of meta-social-choice theory—hopefully under a nicer name—and this is where logic will play a crucial role.

Yours certainly seems to be a blossoming field. It's a nice way to take logic to the people in a sense, since it tackles aspects of life which affect us all—like voting procedures. I remember being mesmerised as you told us in a game theory class how the supposedly democratic decision on whether to move Germany's parliament was in fact skewed. Is this something which makes it appealing to you—the fact that these formal tools really attach to something in real life?

I've always felt some kind of envy towards people who apply their analytic tools to improve certain real-world mechanisms. I'm thinking here more of economists who design markets for specific purposes rather than management consultants who—from what I can tell—work in a much less formal domain. The design of voting procedures also fits into that category, and, similarly, a housing allocation project at Stanford in which I'm currently involved. We're hoping to improve the way that Stanford students get assigned to their residences.

What's wrong with the current allocation system?

Discovering what could be better is part of the challenge. One change the administration is planning is that seniority gives you better housing, i.e., the longer you are at Stanford, the better your accommodation will be. Another challenge is of course the discussion whether, for example, this seniority system is something we consider to be fair. These problems are rather traditional social choice problems that have been investigated quite a bit. But my hope is that by coming

to this area as a logician, certain new questions will arise. If in the end, no logic is used in any of this—which may well happen—that's OK. At least it will have been an interesting project with tangible effects on the Stanford community!

If you hadn't gone into your current field of research, what else would you have liked to do—both inside and outside of research?

I actually never considered logic a "final" choice. I can still imagine doing other things, like, for instance, psychology or psychoanalysis. Actually, I did take a few psychology courses as an undergraduate, in particular on cognitive psychology and Jungian analytic psychology—a fascinating subject. In the end, however, I felt that much of academic psychology was just a bunch of experiments held together by rather shallow theories of very narrow applicability. In that respect, I find analytic psychology much more fun: grand theories involving great stories and deep cultural notions that purport to explain everything. Who cares that the theories are wrong—I'd much rather have a wrong theory about the universality of archetypes than a right theory of my perception of a dot moving across a screen!

And outside academia?

I did think about becoming a monk. The only thing there is that I had a hard time deciding on the specific religion. Probably Catholic or Buddhist. Maybe I'll still do both, Catholic in this life, and Buddhist in the next. That would be a bit like a cross-religious wager of Pascal, certainly a safer bet than the reverse order...

Marian Counihan

FROM THE ILLC PHOTO ALBUM

Amsterdam and Georgia Celebrate a Tenth Anniversary

Ten years after the first Tbilisi Symposium on Logic, Language and Computation in the Georgian mountain resort of Gudauri (1995), the Sixth Bi-Annual Tbilisi Symposium took place in the city of Batumi on the Black Sea. The ILLC Magazine celebrates this tenth anniversary with a glimpse into the unforgettable moments of Batumi 2005.

Day One: The small things that make a big difference

Dick de Jongh and Jan van Eijck enjoy Georgian produce on the journey from Tbilisi to Batumi.

Day Two: The Dutch connection

Dick de Jongh, Henk Verkuyl, Kata Balogh, Yde Venema and Barbara Partee with the first lady of Georgia, Mrs. Sandra Roelofson, originally from the Netherlands, who graced our inaugural conference dinner with her presence.

By **Reut Tsarfaty**
Photographer Kata Balogh
Thanks to Kata Balogh, Nick Bezhanishvili, Marian Counihan and Scott Grimm.

Night Two: A picture worth a thousand words

Dick de Jongh, Henk Zeevat and Rusudan Asatiani dance the night away.

Day Three: "Excursion Theory"

Aravind Joshi enjoys our organized day-trip to a church in the Georgian mountains.

Night Three: "Tamata Theory"

Matthias Baaz, the acting tamata ("master of ceremonies"), proposes a toast for his fatherland and passes it on to the other participants to raise a glass for their own.

The Last Night: Goodbye!

The Georgian sun goes down on a week of unforgettable experiences, great food and wonderful friendship. See you next time!

A Tribute: Georgian alumni of the ILLC:

Dr. David Gabelaia (MSc of Logic) and Dr. Nick Bezhanishvili (PhD) enjoy home-made food.

Is Logic to Linguistics What Mathematics Is to Physics?

Senior ILLC members will remember Hugo Brandt Corstius from his time as a computational linguist at the UvA. To the rest of the Netherlands, he is better known as a prolific writer and journalist whose work has appeared in, among others, Vrij Nederland and de Volkskrant. In the following piece, written especially for this issue of the ILLC magazine, his experience in logic and journalism come together to give a fresh perspective on the role of logic in linguistics.

What We Can Learn from the Greeks

The Greeks were great mathematicians. Shouldn't the previous sentence read: "There were some great mathematicians in Greece in the centuries around 400 B.C."? No, because when one refers to "the Greeks", one means "the Athenian intelligentsia in classical antiquity". And they were interested in mathematics, much more so than the European intelligentsia around 2000 A.D.

We see this, for instance, in Plato's report of a conversation between Socrates and Theaetetus, where the observation is made that the square roots of 3 and 5 are not fractions. This was appreciated by contemporary readers and listeners. Similarly, the proof that the square root of 2 cannot be equal to a fraction is mentioned merely in passing by Aristotle. The Greeks were evidently aware of this fact, while the European public of today have difficulty even understanding the problem (as shown by the many bad translations of the relevant passages in Plato and Aristotle).

Yet the Greeks, although great mathematicians, were lousy physicists. They philosophised about atoms, sure, but not in a useful way. They simply had no idea of the first necessity of physics: the formulation and execution of counter-examples to a theoretical supposition. They had no idea of the necessity of even the simplest devices—thermometers or magnifying lenses.

The lesson to learn from the Greeks is this: one can do mathematics without any knowledge of physics, but one cannot do physics without a sound knowledge of mathematics. A more modern illustration of this is given by E.J. Dijksterhuis. He has shown in his *The Mechanisation of the World Picture* (1950) that modern physics could only blossom thanks to the mathematical approach, starting with mechanical physics. Often, the physicist finds that a mathematical formula he requires has already been invented by a mathematician. In theoretical physics, the border between mathematics and physics is frequently indiscernible.

It is tempting to think of the development of logic as playing the same role in linguistics—and notably in semantics—as mathematics has played in physics. I want to question that idea.

From Athens to Port-Royal

From Aristotle to Arnaud, logicians have introduced notions of conditional truth, predicates, negation and so on, in order to improve the quality of argumentation and understand its essence. From Aristotle to Arnaud, logic was certainly also proposed as a handmaiden to linguistics. Alas, linguistics, as currently practised, is a very young science. The linguistic ideas of the Athenian Academy and the Parisian Port-Royal appear to us no less antiquated and useless than the atomic theories of the Ancient Greeks.

I think it was George Boole who invented a new form of logic which has exerted a strong influence to this day on linguists who are interested in the way languages treat meaning. Boole's treatment of words such as "and", "or", "not" and "if…then" can be seen as improvements on their often sloppy usage in everyday speech. The laptop on which I am writing can best be described with formulae using Boole's notation. But does Boole's wonderful idea mean that linguistics must use logic, just as physics had to use mathematics?

"One can do mathematics without any knowledge of physics, but one cannot do physics without a sound knowledge of mathematics."

Let me give some anecdotes. They don't prove anything, but they illustrate why I have reservations about the idea that logic is going to be the necessary medicine for semantics.

Tarski, Chomsky and Friends

Logicians often have remarkably little respect for human language. When I met Tarski in 1961, I remarked, not in class but during a stroll in Berkeley, that his famous definition of truth ("P" is true iff P) makes no sense in Dutch, because the sentence *"Snow is white" iff snow is white* needs a slight syntactic reordering to: *"Sneeuw is wit" desda sneeuw wit is*, with the *is* in the last position. He was not amused. Years later, I made a similar remark to Richard Montague when he mentioned the difference between the verbs "search" and "find". He did not throw his chalk at me as he once did at a critical questioner, but neither did he deign to answer.

In 1957 an uncle of mine who worked for Mouton and Co. gave me one of the first copies of Noam Chomsky's *Syntactic Structures*. I was astonished that Chomsky (I had never heard of him) had made the elementary mistake of drawing from the proven fact that a certain collection of English sentences could not be produced by a certain type of grammatical rules, the conclusion that the collection of all English sentences could not be produced by that type of rules. Whence the necessity of linguistic transformations. When I met Chomsky later at Frits Staal's house in Amsterdam, I put my objection

to him. He was not interested. So I never got to tell him how, in this special case, his conclusion could stand only as long as certain simple mathematical theorems were applied. Never have I met a linguist who showed any interest in either my objection or my solution.

My Ph.D. supervisor, Aad van Wijngaarden, gave in his inaugural address a very optimistic view of the possibility of automatic translation of natural languages. I told him how Yehoshua Bar-Hillel had demonstrated that a computer would need to have complete knowledge of the world before computer translation was at all possible. He gave me permission to stop thinking about automatic translation and do other things.

The great disillusion of my life is that language remains incomprehensible to computers. I was an admirer of the work done by Landsbergen, Scha and Bunt at the Philips Physics Laboratory to make a program for question-answering—the first program to implement Montaguesque ideas. Philips killed the research. Landsbergen switched to computer translation. The best result I have seen is the translation of the English sentence "He *likes* to swim" with the finite verb form likes and the infinitive *to swim* into the Dutch sentence with the same meaning, "Hij *zwemt* graag", with the finite form zwemt and the adverb *graag* at the bottom of tall trees bristling with lambdas and all manner of brackets and parentheses. It was certainly a better translation program than any I had seen before. Still, I concluded

that I would not live to see the introduction of full-fledged computer translation, and neither would you.

Laughing Logicians?

One evening at a party next door, I met several people working on the application of logic (called modern logic after Tarski's book, whereas Van der Waerden's book Modern Algebra, which we had to learn by heart, is now called Algebra). I told them I had a collection of sentence-pairs in which the only difference was that one sentence used the conjunction "but" where its twin used the conjunction "because". The meaning of these sentence-pairs should, so I claimed, be identical. I revealed one such pair: "Parliament approves the Royal Marriage law but the father of the bride will not attend the ceremony" and "Parliament approves the Royal Marriage law because the father of the bride will not attend the ceremony". They laughed, seeing the ridiculousness of my claim, but did not agree that Boole had overlooked something. The words "but" and "because" may well have been invented to give the listener the impression that we are rational beings, yet world history shows with hopeless clarity that this is not so.

I follow with great interest the work of logicians on language, but I feel I have to tell them: logic cannot do for linguistics what calculus did for physics.

Hugo Brandt Corstius

I N S P I R I N G   R E S E A R C H

H AVE YOU EVER ENCOUNTERED A PIECE OF RESEARCH WHICH IS SO INTERESTING, WELL-WRITTEN OR ELEGANT THAT YOU WISHED YOU HAD WRITTEN IT YOURSELF? O R PERHAPS YOU APPRECIATED IT BUT THOUGHT IT WAS IN NEED OF IMPROVEMENT? O FTEN THESE ARE THE PIECES WHICH SET US OFF ON OUR ACADEMIC PATH. A S IN LAST YEAR'S ISSUE, WE POSE THESE QUESTIONS TO TWO SENIOR ILLC STAFF MEMBERS. T HIS YEAR, A NNE T ROELSTRA AND M ARTIN S TOKHOF TELL US ABOUT RESEARCH WHICH HAS HAD A DECISIVE INFLUENCE ON THEIR ACADEMIC CAREERS.

Through Darkness to the Light

As a graduate student, I heard about L.E.J. Brouwer's intuitionism. This was fascinating: an alternative way of looking at mathematics, resulting in a deviant mathematical practice. The idea of mathematics as the study of mental constructs, which made mathematics somehow more direct and concrete to me, held great appeal. There was an obvious way of learning more about this topic: following Arend Heyting's courses and buying his book *Intuitionism, an Introduction*, the first edition of which had appeared in 1957.

It was a good thing that I got my introduction to the subject this way; if I would have tried to study Brouwer's own papers first, I might well have been put off the subject forever. Heyting's book, on the other hand, was a masterpiece of clear exposition. The most intriguing topic in the whole book was choice sequences and their properties; this had no obvious parallel in classical mathematics. But it was there as well where I had some real conceptual difficulties. The so-called fan theorem (classically, this just amounts to the compactness of the Cantor discontinuum) was motivated by an argument, due to Brouwer, in which it was stated that all *intuitionistic* proofs of statements of a certain form must have a certain 'canonical' form. This statement - though more or less plausible - came out of the blue. I still suspect that Heyting himself never felt quite at ease with this particular argument.

Then Heyting lent me the *Stanford Report on the Foundations of Analysis* - essentially a collection of preprints - and I found there a paper by G. Kreisel in which the choice sequences, including the puzzling argument concerning the fan theorem, were systematically explained away. This was done translating statements involving quantification over choice sequences into statements not involving choice sequences. The basic idea of the paper was simple and brilliant: taking Brouwer's informal descriptions and remarks about the nature of choice sequences seriously, obtain from this enough axioms to make the translation work.

So when there was a chance to obtain a stipend to study abroad,

I choose Stanford, Kreisel's base, as the place to go to. There I started an in-depth analysis of Kreisel's paper, baffled by what seemed at first a mere technical difficulty, but which was in fact a conceptual mistake leading to not quite the right axioms for choice sequences - and I ended up writing a very long joint paper with Kreisel. This started me in earnest on a career as a logician. Summing up, this was the result of reading an excellent book and a brilliant paper. They stimulated me; but ultimately, it has been their defects which led to my own contribution.

Anne S. Troelstra

A Mild Case of Schizophrenia?

When asked to write about decisive influences on my research, two titles and their authors immediately came to mind: Montague's "Universal Grammar" and Wittgenstein's *Philosophische Untersuchungen*. Not the most obvious combination, perhaps, but definitely two works that shaped my thinking, if only by pulling it in opposite directions.

Although "The Proper Treatment of Quantification in Ordinary English" definitely was the most seminal of Montague's papers on formal semantics, the one everyone at the time embraced as a standard, in retrospect it was "Universal Grammar" that was more formative. Because of its completely general nature, its abstract yet precise approach to what language is, how syntax and semantics interact, and how both can be captured in an algebraic framework, it left a lasting impression. It was an introduction to a way of thinking that shaped, if not exactly what Jeroen Groenendijk and I went on to do, then at least the spirit in which we did it.

Wittgenstein's *Philosophische Untersuchungen*, on the other hand, utterly failed to impress me when I first encountered it. I remember reading the first 30 or 40 sections in my second year and finding it uninspiring, a collection of rather obvious observations that seemed to lack a point. It was only many years later that I picked it up again and slowly began to realize what it had to say. At first I was merely fascinated by its strangeness, later I began to see what consequences it might have for our understanding of language. And only subsequently did I appreciate how Wittgenstein's vision of language ties in with his thinking about thought, action, and value.

Both works influenced me deeply, but in different ways, and with different effects. "Universal Grammar" is no longer widely read. Its ideas have inspired an epoch of research, they have found their way into textbooks, and some of them have been superseded by different ones: the way things go in science. The *Philosophische Untersuchungen*, however, continues to be read and re-read, interpreted and re-interpreted, and that seems characteristic for a philosophy that is non-linear, almost circular, and certainly hermeneutic.

That explains the motto. Now one might think that quoting Goethe is only a display of "cultural correctness", and that I might just as well have used "Torn Between Two Lovers" from the Carpenters. But, apart from actually hating the song in question, I have another reason for preferring Goethe - the way in which the passage continues:

Die eine will sich
von der andern trennen;
Die eine hält, in derber Liebeslust,
Sich an die Welt
mit klammernden Organen;
Die andere hebt gewaltsam
sich vom Dust
Zu den Gefilden hoher Ahnen.

The appropriateness of these lines is almost uncanny. The first marks the tension that will be obvious to anyone who is familiar with both texts, the following ones explain it in terms of an opposition between "world" and "other-world". One clings to the world of everyday, whereas the other fights off its shackles and rises above it. And so they do. The *Philosophische Untersuchungen* remains in the everydayness of language, its various uses in different contexts, its vagueness and flexibility. "Universal Grammar", on the other hand, abstracts away from those idiosyncrasies, laying bare the general principles that are hidden by the outward shapes of languages.

Is this a tension that we can find relief from? A conflict between competing views that can somehow be settled? To many it seems that way and they have chosen sides. But I wonder. Does the success of formal semantics, Montague-style, really prove Wittgenstein wrong? Are we committed to reject semantics once we acknowledge the acuity of some of Wittgenstein's observations? I do not think so. The real insight that can be had here, I venture, relates to the nature of semantics, not to its content or its form. What exactly that means is something that I have been thinking about for some time, and will probably continue to do so for many years.

Martin Stokhof

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New staff members

Avi Arampatzis, 33
From
Greece
Research topic
Information Retrieval
Supervisor
Jaap Kamps

Ulle Endriss, 33
From
Germany, although I arrived in Amsterdam from London.
Academic background
I studied Computer Science in Karlsruhe, London and Berlin, and then completed a Ph.D. in Logic and Computation at King's College London.
Research topic
Very broadly speaking, my research area is logic in computer science and AI, but these days I'm particularly interested in issues at the interface with social choice and game theory. Much of my recent work has been on negotiation in multiagent systems.
Your 'research role model'
The best example I can think of is my PhD supervisor, Dov Gabbay. Why is not easy to explain, but those who know him will understand.
Your favourite formula

$$\Phi = \frac{1+\sqrt{5}}{2} = \lim_{n\to\infty} \frac{Fib_{n+1}}{Fib_n}$$

Favourite aspect of Amsterdam
Fietsen.
Least favourite aspect of Amsterdam
Lunchen.

Eric Pacuit, 30
From
I am originally from Akron, Ohio and have lived in New York City for the past five years while working on my Ph.D.
Academic background
BS and MS in mathematics, Ph.D. in Computer Science
Research topic
Modal Logic, Logic and Games, Social Software, Game Theory
Collaborators
Benedikt, Johan, Ulle, Clemens, Helle, Olivier...
Your favourite game
At work, I enjoy Ehrenfeucht-Fraisse Games (at least this semester), although at home, for some reason, my wife would rather play Scrabble.
The best advice you ever got
Stop working and come for a drink (from my wife).
Favourite aspect of Amsterdam
Riding my bike to an outdoor wine bar or café.
Least favourite aspect of Amsterdam
Riding my bike in the rain to sit indoors at a smoky bar.

Leigh Smith, 38
From
Perth, Western Australia
Academic background
Bachelor in Applied Science and Post Graduate Diploma in Computing Science from Curtin University of Technology, Western Australia and Ph.D. from the University of Western Australia, both located in Perth.
Research topic
Computational modeling of the cognition of musical rhythm using multiresolution analysis, including evaluation of models of rhythmic syncopation, modeling the influence of tempo on timing judgments, representation of musical expectation
Collaborators
Henkjan Honing and Olivia Ladinig
Favorite aspects of Amsterdam
Kriterion cinema, Bimhuis, de Badcuyp, Tropentheatre seeing jazz, improvised and world music performances, the many wonderful musea of Amsterdam, spontaneous symposia (drinks) with fellow ILLC'ers.
Your favourite game
John Zorn's musical game "Cobra": there are rules, participants, an umpire, an audience, protagonists, reactions and a musical result, but no one wins or loses.
The best advice you ever got: "Don't give up your day job" (after listening to my singing).

New PhD students

Samson Tikitu de Jager, 24
From
New Zealand
Academic background
Computer Science
Research topic
Evolutionary models for formal pragmatics and semantics
Supervisors
Robert van Rooij, Remko Scha
Your favourite game
Go
Your favourite formula
Volume proportional to dimension cubed, surface area proportional to dimension squared. Explains why elephants but not mice have huge flappy ears, why insects don't grow to people-size, and why those 3kg economy packs of sausages take forever to defrost.
Your 'research role model'
Those crazy Royal Society dudes who worked in optics and gave blood transfusions to dogs and designed explosion-proof fortifications and spent far too much time around mercury, etc. We're so specialized these days that it's rare for me to take a useful insight from somebody else's work outside my own field (or indeed really to understand it), which is a terrible shame.

Michael Franke, 27
From
Germany
Academic background
Cognitive Science B.Sc., Logic M.Sc.
Research topic
Formal Pragmatics
Supervisors
Robert van Rooij, Martin Stokhof
Your 'research role model'
I like the condensed clarity of David Lewis' writing, the undeviating self-abandonment of Wittgenstein's thinking, and the uncompromising, if not violent, poetic depth of Nietzsche's work.
(Least) favorite aspect of Amsterdam?
(Sorry, but) I think that the city has a very selfish, inconsiderate and narcissistic flair at times. I'm also not into violent biking, spacious districts dedicated to sex and drugs, or the disproportionate exploitation of expatriates through a crippled system of a housing corporations. Amsterdam is beautiful though, special and charmingly small but international.
In other possible worlds...
In the best of all my dream worlds I have given up a normal life entirely in dedication to the mastery of some art, be that spiritual or physical, or some craftsmanship. Which means that I have seen one too many martial arts movies during a critical period in childhood!

Daisuke Ikegami, 24
From
Tokyo, Japan
Academic background
Mathematical logic, especially set theory
Research topic
Descriptive set theory, especially determinacy
Supervisor
Benedikt Loewe
Your 'research role model'
Hugh Woodin, one of the leading persons in set theory.

I like to work ...
At desks in my office or my apartment. Sometimes I work when I am in my bed, in a train, in a tram, and when I walk.
Your favourite game
Infinite games
Your favourite formula
Just do it!
The best advice you ever got
Find your own way.

Marijn Koolen
From
Wieringerwerf, The Netherlands
Academic background
Artificial Intelligence, UvA
Research topic:
Information Retrieval using metadata. In our project we are collaborating with the Gemeentemuseum in Den Haag and using their digital collection to see how metadata can help in retrieval.
Supervisors
Jaap Kamps, Maarten de Rijke
I like to work...
In our room at the Gemeentemuseum. It's located behind one of the "style-rooms" of the museum, so I can wander through the museum every day.
And to not work...
I like to go to places with live music. Thankfully, there are many places in Amsterdam where bands play every night.
Your favourite formula
Easyjet is cheap
The best advice you ever got
"Next time, unlock your bike before you try to ride it..."

Olivia Ladinig, 27
From
Klagenfurt, Austria
Academic background
Cognitive musicpsychologist (and dilettant-musician)
Research topic
Music (especially rhythm) cognition and perception
Supervisors
Henkjan Honing, Remko Scha, Leigh Smith
I like to work...
In cafes with deliberately-picked music, park benches, at home, and of course in my gorgeous office.
And to not work...
In Gloomy places where people are dancing, at the seaside, in towers of national monuments.
Your 'research role model'
Alice in Wonderland: always curious, always expecting the impossible.
Your favourite formula

2 parts gin and one part martini
In other possible worlds...
I am touring with Blixa Bargeld through Japanese concert halls or studying magic.

Floris Roelofsen, 25
From
The Netherlands
Academic background
BA Applied Mathematics, MA Human Media Interaction, MA Logic and Philosophy
Research topic
Philosophy of language, dynamic semantics, semantics and pragmatics of questions
Supervisor
Jeroen Groenendijk
I like to work...
Close to the people who inspire me.
And to not work...
In the mountains, on the beach...
Favourite aspect of living in Amsterdam?
One of the great things about Amsterdam is its dance scene. From ballet to contemporary dance to salsa, Amsterdam has some of the best teachers, choreographers, and performers.
In other possible worlds...
I would have auditioned for the dance academy in Amsterdam and Rotterdam, and probably I would have applied for PhD positions at Stanford, Groningen, Liverpool, and Dunedin. If that had not worked out, I may have gone on a long bike trip.

Jakub Szymanik, 25
From
Warsaw, Poland
Academic background
I got my degree in philosophy from Warsaw University. My thesis was on computational semantics for monadic quantifiers. I also studied some psychology and mathematics.
Research topic
I am interested in formal semantics of natural language and its connection with pragmatics, logic, linguistics and cognitive science. Currently, I am working on computational semantics for quantifiers in natural language.
Supervisors
Paul Dekker. I am also still working with Marcin Mostowski from Warsaw.
I like to work...
I prefer to work in some quite sunny spot outdoors.
And to not work...
When not working, I enjoy being somewhere in mountains.
(Least) favorite aspect of living in

Amsterdam
The best things are huge windows. The worst thing is for sure that Holland is extremely flat.
In other possible worlds...
I do not believe in possible worlds. But assuming for the moment their existence, I would be an alpine guide.

Joel Uckelman, 27
From
USA
Academic background
BS in Philosophy and History, MA in Philosophy
Research topic
Modal logic, but my interests are rapidly moving toward game theory.
Supervisors
Benedikt Loewe, at present. I'm still searching for a permanent one, though.
Your favourite game
That's a hard question for someone who is interested in game theory and plays actual board games as a hobby.
Your favourite formula
Pierce's Law: $((p \rightarrow q) \rightarrow p) \rightarrow p$
Least favourite aspect of living in Amsterdam
I miss *real* winters.
In other possible worlds...
I've always wanted to try designing board games.

Sara Uckelman, 23
From
Madison, WI, USA
Academic background
BAs in English and Philosophy, MA in Philosophy—all from the University of Wisconsin-Madison
Research topic
Theological influences on the development of logics of time and tense in the Middle Ages
Supervisor
Benedikt Loewe
Your 'teaching role model'?
Dr. Mike Byrd, my advisor at UW-Madison. He was the best teacher I have ever had; he was constantly fascinated by his subject and could transmit that fascination to his students, and he was the only professor I ever knew who regularly learned the names of all the 80-100 students in his lectures.
The best advice you ever got
"Don't marry someone you can live with, marry someone you can't live without," from my mother, and "Back-up your computer files on a weekly (if not more frequent) basis", from my father.

In other possible worlds...
Gosh, I really don't know. This is exactly where I want to be and what I want to be doing with my life right now. Anything else would not be as good.

Levan Uridia, 25
From
Georgia
Academic background
Master in Mathematics
Research topic
Modal and Fixed Point logics
Supervisor
Yde Venema
Your favourite game
It's called "find me!"
Your favourite formula
$G(\bot) \wedge H(\bot)$ (G, H are temporal modalities $G = \neg F\neg$, $H = \neg P\neg$)
It says: "don't look in the future, don't look in the past, live with today".
The best advice you ever got
"Don't give out advice for free."
Favourite aspect of Amsterdam
Argentinean Tango, wild attractions on the Dam, water pipe cafe (no, not marijuana, just the water pipe), Flevopark, peaceful silence in Amsterdam Noord.
Least favourite aspect of Amsterdam
Bureaucracy, the queue in front of Paradiso, and I miss Georgia.

Andreas Witzel, 26
From
Merzhausen, Breisgau-Hochschwarzwald
Academic background
Computational Logic (M.Sc.)
Research topic
Currently, it's mainly about finding out what my research topic will be. It should be in the areas of game theory, logic and computer science, maybe related to multi-agent systems and mechanism design.
Supervisors
Krzysztof Apt, also, Ulle Endriss
Your 'research role model'
Although no researcher, my teacher Karl Stamm first acquainted me with Prolog, which arguably got me into this whole computer and logic thing.
The best advice you ever got
Hic tu fallaci nimium ne crede lucernae, Iudicio formae noxque merumque nocent.
Favourite aspect of Amsterdam
My future place, a floating house.
Least favourite aspect of Amsterdam
The lack of mountains (with height > 0) for biking and hiking.
In other possible worlds...
I was thinking about working as a language teacher in Russia for some months.

Introducing… PPfLogiM

This year we're very happy to announce a new project at the ILLC: the PPfLogiM, (Puzzles Page for Logicians in the Magazine). We're still waiting for sponsorship from the EU. All readers are invited to participate in the project and there will be a prize for the first set of correct answers (see details below).

1 | You've just sat down on your favourite bench and are about to start eating your lunch after a hard morning's work on complexity theory. In an effort to part you from your cheese sandwich, a man sitting on the other end of the bench suggests the following game. He lays out ten matches on the plank between you. You take turns to remove either one, two or three matches. The winner is the one who takes the last match. Should you go first? Or insist that he does? What should your strategy be?

2 | The next day the man is sitting on your bench again. This time you have a puzzle for him. If he can guess which cheeses you are referring to in the following cryptic clues, he can have your cheese sandwich. But first he has to know what the cheeses are…
- Member in cat
- It's made backwards
- Sam returns to fish number
- Author follows mythical character

3 | Four playing cards—one of each suit and one each of the jack, queen, king and ace—are laid out in a row.
- The heart isn't next to the club.
- No card is next to its immediate senior in rank.
- The colors of the suits alternate.
- The king and queen face in opposite directions.
- The jack of diamonds is not in the row.
What are the four cards?

4 | Fill in the blanks with the numbers 1 to 5 so that no row, column or diagonal contains the same number more than once. Which number should replace the question mark?

			2
	1		?
4			3
	2		

5 | What connects ESSLLI 2004, this year's Spinoza chair and Ronald Reagan?
    What connects The Brothers Karamazov, Nooit meer Slapen and Principia Mathematica?

6 | Start with an urban area. Change one letter and I am soft feathers. Change another letter and I am the sunrise. Change a letter once again and I am a grassed area. Change one final letter and I am a young deer. What was I and what did I become?

Please send your answers to Ingrid van Loon at ingrid@science.uva.nl.
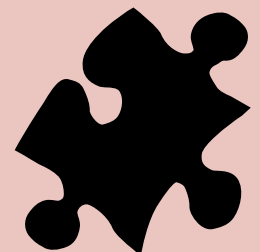
The Next Generation of the ILLC

Photographer: Yanjing Wang