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Logic Tea in Oxford

Martin Bays and Jonathan Kirby

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Logic Tea in Oxford

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We assemble some recollections of Boris Zilber from students and others in the Oxford logic group from the time he arrived in Oxford in 1999 to when the Mathematical Institute moved building in 2013, centred around the daily Logic Tea in the St Giles' building common room.

The institution of Logic Tea. When Boris Zilber arrived in Oxford, he instituted a daily Logic Tea in the Mathematical Institute. Gareth Jones recalls:

> When I first arrived in Oxford, it wasn't quite clear whether Alex Wilkie or Boris would be my supervisor. When Boris and I met, he said something very much like "You should come to tea every day at 4pm". So I did, throughout my time in Oxford.

Nick Peatfield was Boris Zilber's first PhD student, arriving in Oxford just before Boris in 1999.

> In that first year, Logic Tea was the main focus of many days for myself and the other four PhD students in model theory in years above me, all being supervised by Alex. We talked about maths and life. I remember Boris talking about the importance of developing a community in an area of mathematics, and over the next few years we had various visitors and more PhD students, leading to a vibrant community at Logic Tea each afternoon.

The institute was then housed in its original 1966 building at 24–29 St Giles, a short distance from its current location in the Andrew Wiles building. The common room was somewhat poorly lit, getting only a little natural light from a window at the front, when that part of the room was not partitioned off as a classroom, and one window looking out to the bike shed area to the rear. There were lighted cabinets containing some mathematical curiosities, and the lighting from these was a necessary supplement to the ceiling lighting. As a result the room was cosy, and the warm glow of the conversation with people leaning in to scrawl on the small whiteboard-topped coffee tables leaves memories akin to a gathering around a winter fireplace.

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Many other research groups gathered for tea once or twice a week, before or after their seminars, but the daily frequency of the logic group tea and the number of its adherents were unusual. Indeed, it was a regular occurrence for the circle of chairs to gradually get pushed back as more and more people came to join the logic tea, often to listen to whatever Boris was talking about that day. Assaf Hasson had been a student of Hrushovski before coming to Oxford as a postdoc to work with Boris. He explains:

> Boris is willing to discuss — with the same level of enthusiasm — his ideas with anyone interested: from young grad students, through great mathematicians, physicists (of course), philosophers, or anyone who happened to sit next to him at dinner or during tea time.

As Juan Diego Caycedo recalls,

> Logic Tea was great, you never knew what you'd get: mathematical ideas, stories from the Soviet Union, or something truly random like a breakfast TV show's discussion of how much sunscreen children should use!

Of course, it was not always Boris taking the lead. Gareth Jones recalls that

> Alex and I often talked about cricket or football, depending on the time of year. I've tried to carry on that tradition with my students (with varying levels of success).

Martin Bays explains how central Logic Tea was to the group in his time:

> Logic Tea was the daily ritual of proffering 30p for a cup of barely drinkable coffee, thanking Helen Cullen who always served it, and sitting at a table to hear the latest iteration of Boris's stories and ideas, a ritual which formed the backbone of my time in Oxford. At that time, Zilber's group all worked on a circle of ideas centred on his programme on exponentiation, and Wilkie's group worked on related topics from a different perspective, so bringing us together for tea gave us a crucial overview of what we were collectively working on, how various parts of it were progressing, and where we might go next. I didn't realise at the time that this was anything special, but this unity of purpose is something I've yet to see in any other group. Conversations slipped, largely at Boris's whim, between stories of the past, speculations on politics and philosophy, discussion of random mathematics or physics outside of our expertise, and the more concrete topics of our research, and I suspect that this free flow was a crucial part of a magic which seems impossible to replicate without a Boris.

The oral tradition of mathematics. For Boris, mathematics seems to be primarily an oral tradition. While written mathematics is of course important, it is the discovery and transmission of mathematical ideas in oral form, perhaps supplemented by a diagram and some symbols on a board, which excites him the most, and his excitement was certainly something he communicated to his students. There was only so much space to write on the coffee tables, but the distinction between a tea-time talk and a seminar was not always clear. Tom Foster and others recall

> . . . those seminars about Zariski geometries where at the start Boris would draw a triangle and by the end of the hour that would still be the only thing on the board.

Cecily Crampin was a student of Alex Wilkie who later changed career to law.

> The thing I most remember about Boris, and which has influenced me in one aspect of being a lawyer, is a talk he gave in the 2000 Logic Colloquium in Paris. To my mind, a lot of the talks tried to take the listener through a proof or proofs as if the listener were reading a paper, and without the time I needed to go back and scratch my head and reread the first bit so I understood the steps. Boris didn't do that. He gave a talk in which he explained why he was interested in the area of logic which he was working on (and in which my DPhil work was based by his suggestion). The description was much more ideas dancing than the nitty gritty of proof. I could see it and I was excited by the vision of what could be achieved. I still remember that, though the maths has long escaped me. That way of speaking about a very technical subject when giving a talk has influenced the way I approach giving seminars in property law.

One possible reason for this emphasis on oral mathematics comes from his experience of undergraduate exams in Russia, which were usually oral exams. One anecdote Boris would recount of those days was of a professor who found a clever way to reduce the time taken to do individual oral exams for the dozens of students in his class. First, he challenged the students that if they had not done the work to prepare, they would be wasting their time to wait for their turn, so he invited those students to leave. Once they had gone, he asked which of the remaining students would be satisfied with a D, the lowest passing mark. They were invited to give their names and leave. Then he asked who was sure they would get an A. No point wasting time on them. Finally, of the remaining students, he asked which of them wanted a chance to upgrade their C to a B, and these he would examine!

This oral mathematical background is visible in the draft manuscripts of Boris with which his students would grapple. He would start with an outline of the argument, and then in places the details of statement and argument and definition would be sketched in more and more detail, as if in answer to an interlocutor.

Tom Foster was one of Alex Wilkie's students who remembers one discussion at Logic Tea

> ...about "proof", where I made what I thought was the uncontroversial point that I didn't think you could know something to be true until you had written down the proof. Of course Boris completely rejected this point. I guess Boris just discovered things in his head and it was up to others to formalise the proof.

Alex himself provided a wonderful counterbalance to some of Boris's traits, and it was perhaps just as well that at Logic Tea we also heard his point of view on proof and could take our own path between the two. Many readers will have seen one of Alex's handwritten manuscripts where arguments are developed carefully, line-by-line.

Another student of Alex Wilkie was Henry Braun, who was already working on Boris's conjecture that the complex exponential field should be quasiminimal when Boris arrived in Oxford. Most memorable to him was

> ...not tea but a chat as we walked together across Oxford to lunch at Merton. Boris observed that the thinking he did indoors and outdoors was different. Indoors, looking close to his hands, was good for manipulative algebra. Outdoors, with eyes raised to the scenery, was the place for geometry. One must be alert to both. The importance of choosing the right environment for the work in hand is something I have carried into my career outside logic.

Russian / British culture. The culture shock of arriving in Oxford from post-Soviet Kemerovo must have been significant, and in the early years this was a regular topic of conversation.

Henry Braun recalls that, in his first couple of weeks, Boris had to get used to being "Boris" to the graduate students, not "Boris Iosefevich", without disrespect.

Nick Peatfield remembers

> ...his recollections from Russia, and in particular his assertion that "if everybody around you keeps repeating something for years and years, you will end up believing it". A scary thought in these times, but also a sign that Boris himself was adjusting to some of the assumptions about life prevalent in the West, but very different to some of those held in the former Soviet Union.

Today, the logic group in Oxford is truly international. However, in the early 2000s almost everyone in the logic group was British. Apart from Boris, just Alex Wilkie's student Mario Edmundo and Boris's student Misha Gavrilovich were the

exceptions at that time. As such, Boris's descriptions of a Russia which was, to us, a very alien world were fascinating.

Vinesh Solanki describes how Boris

> . . . somehow had the ability to speak matter-of-factly and even lightly about some quite difficult things. I remember when he told us the story about his assignment to a university after he had finished his doctorate (which apparently happened automatically and at random in Soviet Russia). His friend had been assigned to a university that was close to the border with China and the two of them were going to be separated by a considerable distance. I can't quite remember what Boris did to change this state of affairs but it was the way he put in his inimitable and matter-of-fact style. "Anyway, at some point I was told that some random redistribution had occurred which put us close enough to each other; what are the odds?"

He also told awful stories about his father's experience during the Siege of Leningrad and of the constant fear of life under Stalin, which really brought this part of history to life for those of us fortunate enough to have led more sheltered lives.

Vinesh continues:

> Boris was often excited by new mathematics and ideas and his excitement rubbed off on me. As a student, at a university with plentiful resources and good mathematicians, I wished to learn lots of new mathematics and there were no obstacles to doing so. During a conversation with Boris, I remember him telling me that original research was harder to come by in Russia and that he had to be more reliant on his own resources. It was these kinds of stories that allowed me to come to a better understanding of what he valued and that in a number of ways, Boris came from a world that was harder than I understood.

If Soviet Russia was strange to us students, then Oxford was also strange to Boris. He was rather surprised but impressed by the British sense of fairness. He recalled that he had asked Roger Heath-Brown, then Director of Graduate Studies, if the money left over from the graduate student allocation could be spent on this or that student? The answer was no, because it would not be a fair process. It was apparently better for the money to be unspent and no one to benefit than for one person to benefit unfairly!

Boris Zilber's approach to mathematics. Boris has always brought outside ideas into model theory. If algebraic geometry was the source in his early days in Russia, then physics was often the source in Oxford. Much remembered by many students was the occasion when Boris was teaching a course on Zariski geometries when a

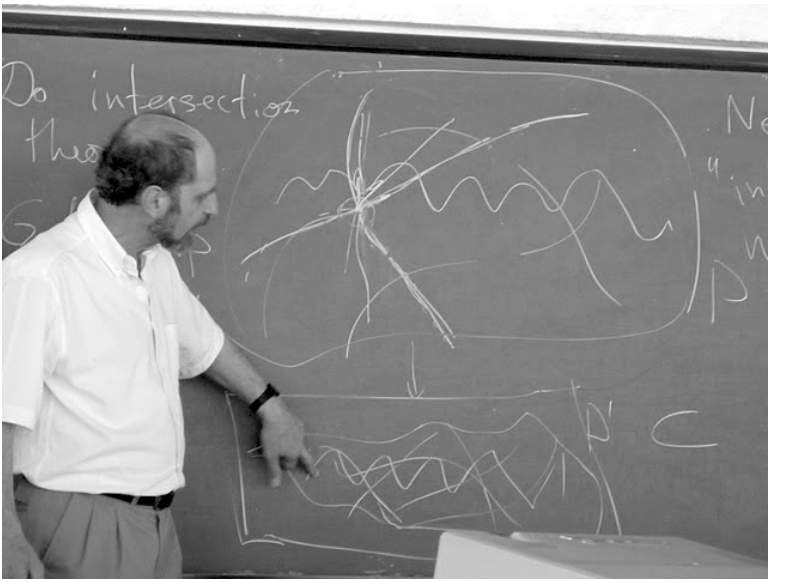

Figure 1. Geometric thinking on the board: a common sight both at Logic Tea and in seminars. Photograph by Andrés Villaveces.

student opened the door from outside and stayed there looking around to decide if this was his lecture. Boris then noticed him, stopped the lecture and asked him what he was looking for. The student asked "Is this quantum?" After a little thought, Boris answered with a smile on his face: "Not yet!"

Jonathan Kirby recalls that at one Logic Tea, Boris asked him to borrow a popular physics book from a college library. Boris soon graduated to the research literature, and his model-theoretic perspective on explaining the mysteries of quantum mechanics via noncommutative geometry became a regular topic at Tea. Indeed, so regular that Assaf Hasson explains:

> The number of times I have seen Boris draw his image of the Zariski geometry he used to interpret as the quantum group at roots of unity is barely countable.

Nick Peatfield recalls:

> One idea of Boris's that stands out is his description of the time taken to engage in mathematics, in comparison with that taken by empirical scientists in the lab. He said that, whereas those scientists go to work each day and get on with their lab work, we mathematicians have to be "at work" a lot more of the time. We have to be "with" the problem we are working on almost 24 hours a day, as the breakthrough is just as likely to happen when you are brushing your teeth in the morning as when you are

> sitting at your desk consciously mulling it over. This idea has seeped into my work as a mathematics teacher educator, where a phrase I repeat often is that expressed by the mathematics educator John Mason: "Teaching takes place in time; but learning takes place over time".

Adam Harris and others remember:

> ... one day when we were in Pisa at a conference and I asked him what he'd been doing today. He told me that he'd been looking round the sights in Pisa with his wife, thinking about mathematics, pretending not to think about mathematics ...

Boris's mathematical insights were often startling but not easy to grasp. Ayhan Günaydin was a postdoc in Oxford.

> I was working on the expansions of the ordered real field by a finitely generated multiplicative subgroup G of the circle S. While proving an elimination of imaginaries result with Alex Berenstein and Clifton Ealy, we had the idea that the structure induced on the quotient S/G from that expansion could be stable. We had some good reasons to think so! Possibly my first day of working with Boris, he asked about what I had been doing in those days. After presenting some results I had proven, I also mentioned that belief of ours. Boris's immediate reaction was "but there are curves there!" while twisting his finger in the air. I had that single sentence in my mind for the rest of the day: there are curves there. What could it have meant? Even if there were curves, why would that be opposed to being stable? There are curves in algebraically closed fields anyway .... I had given up trying to understand it and asked him what he meant. He sent me a very old-looking write-up where it is proven that there are certain curves in certain quotients, which gives rise to defining the real field. After that incident, I learned to pay attention to Boris's fantastical sounding remarks. They are always filled with a lot of insight, however most of the time, it is very hard for us to decipher what he means. It generally takes a great mind like his to do that!

Adam Harris:

> I was often in awe of the way he thought about maths and geometry. There were many times when the conversation moved towards a seemingly far away subject area and he could so easily relate it back to his domain (logic / model theory / stability) in a seemingly simple and obvious way.
>
> I also remember a few times in supervisions when he explained a concept that I believed I understood fairly well in general, but he explained it in such a way that was so illuminating but simple that it immediately

> changed the way I thought about it. There were obviously quite a few fairly confusing times too when he drew another blob with a wiggly line in it and I had no idea what he was talking about!

Boris always made connections and could see past the details to the big picture. Assaf Hasson remembers Boris producing a wonderful phrase:

> I once asked Boris about a preprint I knew he was reading. He said "The results are really very nice, but the paper is locally everywhere wrong". That is still a description I like of a certain kind of badly written papers.

Assaf continued:

> Boris is one of a very few mathematicians I know who has a spark in the eye when talking — not about his results — rather about his mathematical philosophy, vision and conjectures. I think that the Zilber trichotomy is indicative of his style: it is bold, far-reaching, morally true. The fact that it is, in a precise mathematical sense, very wrong does not deter him.

Piotr Kowalski was a postdoc whose time in Oxford overlapped with Assaf Hasson. They were working on Peterzil's conjecture that the Zilber trichotomy should hold for strongly minimal sets which are interpretable in o-minimal structures, and did eventually prove a special case with a long and complicated argument. Piotr recalls:

> Assaf and I were then usually working whole days on this. It turned out to be much more difficult than we had thought and often at the Logic Tea we were discussing the ideas which had collapsed around us. In such moments, Boris was kindly suggesting "Maybe it is time to work on a counterexample?"

The later years. Sylvy Anscombe and Franziska Jahnke, two students of Jochen Koenigsmann, give their own reflections on their experience of Logic Tea with Boris Zilber in the years just before the Mathematical Institute moved buildings.

> Before either of us had ever met Boris, we heard many a legend about him, mostly around his exceptional and deep insights and his central role in shaping our community's research directions through his theorems and conjectures. Long before our time, his reputation preceded him across the iron curtain, and growing up as mathematicians, we heard him spoken of by our professors in awed tones. Martin Ziegler spoke of Boris running an arboretum in Oxford, planting seedlings of ideas into students and colleagues alike. Dugald Macpherson told of the excitement in the Western community when Boris "came to the West". The Oxford administration seemed not as impressed as the research community and

required the award of a fresh Master of Arts degree before he could start his tenure as the chair of mathematical logic.

Personally, we were each interviewed by him before we were accepted as PhD candidates at Oxford, though neither of us was asked testing questions during said interviews. His maxim — then as now — is that it is easy to find a teacher who will explain essentially all they know, but hard to find a student willing to listen. He is a strong believer in learning by permeation, and strongly advocates listening with full attention to talks on almost any subject, in the expectation that frequent exposure to an abstract concept will foster understanding. He led us by example, always willing to ask questions, from those "stupid ones" we were thinking but not daring to ask, to such insightful ones that they turned the speaker's own perspective. At the same time, he freely admitted to a certain nervousness when outlining a research question in front of Saharon Shelah — in case the answer was already obvious to the latter. This humility and his kindness (*Please*! *Call me Boris. My name is Boris*! *Not Prof. Zilber.*) made him approachable from day one. Despite not being supervised by him, we were hugely influenced by his leadership of the Oxford Logic Group.

Although on paper the main event of the week was Logic Seminar, initiates knew that it was Logic Tea that mattered most (incidentally, a daily occurrence with tea served by Helen). Attendance was effectively mandatory, and Boris would gladly pay for your tea if you were short on change. To his lament, the stamina of graduate students for the consumption of tea decreased generation after generation, and eventually only Thursdays would draw a full house. Nevertheless, reliably and daily at 4pm, Boris would be found in the common room of the old Mathematical Institute. It is easy to picture the scene even now: Boris, sharply dressed, trim, sometimes entering the room with his trademark beret.

The topics at tea were as varied as his mathematical interests, and very certainly not limited to mathematics. We learned about life in the Soviet Union, beginning with the stories of his parents during and after the war (as a recommendation: when in the Red Army, do not complain about the lack of shoes), the necessity of bribing officials for just about anything, as well as having Yiddish as a first language (with a smattering of German thrown in for good measure). His life at university brought dangers and adventures: a mandatory undergraduate hike resulted in him and a group of fellow students getting lost in a vast forest, only finding their way back to civilisation by a stroke of luck and a fortuitously located cabin. Later, he had to overcome immense difficulties to obtain a doctorate as a Jewish

student. Although these were difficult topics, Boris recounted them with lightness and his characteristic good humour.

Meanwhile, the denizens of Logic Tea were as varied as the conversation, and Boris's willingness to give advice extended from the youngest master's student to the most eminent visiting speaker. His generosity in sharing his ideas, both on mathematical and more mundane matters, meant that the conversation was free flowing. Further recurrent themes included the beauty and uses of Zariski geometries, the characteristic of the universe (presumably finite), the mysteries of quantum physics, the reticence of (pseudo)exponentiation, and whether the food or the intricacy of the tables was to be preferred at Bangkok House. An all time favourite of ours is the story of how he and his son willingly let a con-artist at a market change a large note into smaller ones for them, knowing they were about to be duped but still keen to watch how the trick was done.

Let's be categorical: Logic Tea was a logically perfect structure. And if we ever need someone trustworthy with cunning and plenty of life experience to steal a horse with, we will choose Boris.

Boris Zilber's character. While Boris's approach to mathematics is most evident at Logic Tea, many students reflected on his character more widely.

Nick Peatfield recalls:

> Boris welcomed me into the model-theoretic community with care and compassion, and his warm and welcoming personality made me feel at home in a place that was new to both of us.

From Tom Foster:

> I have lots of great memories of my time in the logic group and Boris in particular. He created a very friendly and collaborative atmosphere which at the time I think I just took for granted but which in hindsight I realise was quite special.

Vinesh Solanki reflected similarly:

> If I reflect on Boris, I recall his charisma, wit, strength of intuition and generosity. In my time since leaving Oxford, I have come to realise that this combination of traits is fairly rare.

Adam Harris:

> Overall he is a kind-hearted, brilliant human being and I feel very privileged to have spent so much time around him.

This reputation evidently went beyond Oxford. Juan Diego Caycedo writes:

> Shortly before going to Oxford, I met a few model-theorists at a conference in Colombia. When I mentioned that I was going to be Boris's student, the first thing that they said about him was always the same: that he's such a kind person (not something about mathematical vision or the like). After my years there, that's also the first thing that I say myself when I get a chance.

And, lest we get too caught up in the importance of our research, Juan Diego Caycedo recalls Boris giving some perspective on life:

> Of all the teatime stories, the one that I remember the most is the one about how Boris once made a replacement heel for his wife's shoe. She was upset that her shoe had broken and there seemed to be no way to get it repaired or get a new pair. Boris told us that he put a lot of work into it and that in the end he had been as proud of that heel as of any of his theorems.

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