Serguei Shimorin and his work

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Serguei

Figure: Picture of Serguei

Background

Serguei Shimorin died July 18, 2016, during a hike in the mountains of Abkhasia, a disputed part of Georgia in the Caucuses. He was hiking with two friends, Andrei and Roman, and was about to cross the creek Dzhampal. Unfortunately the attempt ended really tragically. He was a young man, born in 1965 in Leningrad. His death is loss for Mathematics and Swedish Mathematics in particular.

Meeting in St-Petersburg

In the fall of 1990 I visited Leningrad in an academic exchange program, which gave me a small stipend from the USSR Academy of Sciences which mainly provided me with a hotel room. There, I encountered a number of prominent participants of the analysis seminar at LOMI (now POMI), such as Nikolai Nikolski, Nikolai Makarov, Vladimir Peller, Alexei Alexandrov, Vasily Vasyunin, and Sergei Kisliakov. This was a difficult time for the people in the USSR, and the country imploded the following year. There was nothing wrong with the hospitality and I was invited home to both Peller and Nikolski. At about this time the factorization method using extremal functions in the Bergman spaces had been developed by myself and others (stimulated by Boris Korenblum at SUNY Albany) and I spoke a couple of times that fall in the seminar. I did not notice then but later understood that among the attentive listeners was a shy young man by the name of Serguei Shimorin. He was studying with Stanislav A. Vinogradov, who himself had studied with Victor P. Havin in 1968 in Leningrad.

Serguei's early work

Apparently my presentations made an impression on Serguei, as a bit later he sent me a preprint entitled "Factorization of analytic functions in weighted Bergman spaces" which later appeared in *Algebra i Analiz* and in English translation in *St Petersburg Math. J.* in 1994. This work (presumably a part of the 1993 thesis) was highly original, especially as he invented a kind of pseudodifferential operators Δ_α such that the analog of Green's formula

$$\int_{\mathbb{D}} (h_2 \Delta_\alpha h_1 - h_1 \Delta_\alpha h_2) dA_\alpha = \int_{\partial \mathbb{D}} (h_2 \partial_n h_1 - h_1 \partial_n h_2) ds$$

would hold for an interval in α, where $dA_\alpha(z) = (1 - |z|^2)^\alpha dA(z)$ is weighted area measure. Later on he developed the theory of these Δ_α further and computed a related weighted biharmonic Green function and obtained its positivity. The issue whether biharmonic Green functions are positive is a delicate matter going back to work of Boggio and Hadamard from around 1900. Another fascinating contribution is "Single-point extremal functions in weighted Bergman spaces", where Serguei developed a *new idea* between univalence and divisor properties of one-point divisors (analogs of Blaschke factors).

Another meeting in St-Petersburg

At some point around 1994-95 I was invited to the home of Serguei and his family (wife Olga and children Anastasia och Mikhail) and I recall that I asked whether he had taken part in any kind of Math Olympiad. That kind of almost sporty activity was encouraged in the USSR and apparently Serguei had done well in some local such olympiad, and showed me a diploma. He also mentioned assuming programming work right after the 1987 diploma before entering the PhD program.

Borichev's suggestion

In 1996 I was taking part in a conference in Trondheim organized by Kristian Seip. There I spoke with Alexander Borichev, with whom I had collaborated successfully when he was a "forskarassistent" at Uppsala in the 1990s. He had then left Sweden for France and now that I had moved to Lund from Uppsala, I suggested he might come to Lund. He declined but suggested I could be interested in Serguei whom he found excellent. With this strong recommendation Shimorin was hired as "forskarassistent" in Lund around 1998 with an NFR grant. Serguei had just spent a year in Bordeaux. The lectureship which I mentioned to attract Borichev went instead to Alexandru Aleman.

My joint work with Serguei

I got Serguei interested in the project to show that the biharmonic Green function was positive for a general weight which was reproducing for a point and also logaritmically subharmonic. This was conjectured but proved difficult to obtain. In the end we succeeded, and Serguei had fundamental insight toward the solution. He derived a property of the corresponding Bergman kernel which together with a twice applied Hele-Shaw flow led to the conjectured positivity. Also in the work on Hele-Shaw flow on hyperbolic surfaces Serguei supplied key insight. He was always meticulously careful and sought elegant arguments whenever possible. As a spin-off he produced the impressive paper "Wold-type decompositions and wandering subspaces for operators close to isometries" published by *Crelle* in 2001. Another work, "Approximate spectral synthesis in the Bergman space" (*Duke Math. J.*, 2000) appeared in this productive period. After 2002, Serguei and I moved to KTH and we continued collaborating on what is known as "Brennan's conjecture". Serguei had an initial insight developed first in *IMRN* in 2003, and later jointly in *Duke Math. J.* in 2005. In 2004, Serguei was honored with the prestigeous Wallenberg prize of the Swedish Mathematical Society (shared with Julius Borcea).

Other contributions

Serguei was was very interested in problems of an Operator Theory character, such as related to "Commutant lifting" and "Complete Nevanlinna-Pick kernels". As I recall, I heard from US colleagues that one of Serguei's works was presented at a seminar in Berkeley, and that Donald Sarason supposedly exclaimed at the end, when the gist of the argument was put forth, the words "That was smart!"
As a scientist Serguei was original with technical ability. But as a person he was very private and rather shy and humble. He was not career oriented but rather an "artist within mathematics", who from time to time would find a beautiful flower and wanted to show it to the world. In our university system such an individual does not get the appropriate appreciation I believe. He was also an appreciated teacher.
In the later years Serguei took to photography (see photosight.ru, pseudonym "Serge de la Mer").

Serguei's pictures

Figure: Le soleil levant

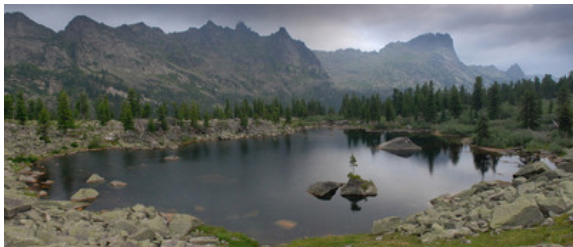# Serguei's pictures

Figure: Summer evening on Khadat

Serguei's pictures

Figure: Morning at artists' lake