

Academic Statement of Purpose  
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born 07.28.1986  
applying to Mathematics department

Since my very childhood, I have been paying special interest to mathematics. In high-school, I attended an experimental mathematical class of a unique atmosphere: we were taught mathematics by Warsaw University professors. It gave me a great opportunity to study among classmates also interested in mathematics. During that time, I had some achievements in competitions, including third place at the National Mathematical Olympiad and bronze medal at the 46th International Mathematical Olympiad. I was especially keen on plane geometry.

After high-school, I decided to study both mathematics and computer science; Warsaw University is offering a convenient program leading to M.Sc. degree in both. Faculty members recognized me as an exceptional student; I always took „starred” (i.e. more theoretical and difficult) variants of subjects whenever possible.

During my first years of study, I was mainly interested in complex analysis, algebra and algebraic topology. I really enjoyed writing my bachelor’s thesis on applications of the theory of Young tableaux to representation theory.

I also enjoyed participation in mathematical competitions: I won one second and three first prizes at the 13th, 14th, 15th and 16th International Mathematical Competitions, respectively.

On my third year, I presented two talks at Prof. P. Pragacz’s Algebraic Geometry seminar at Polish Academy of Sciences; I was not yet into algebraic geometry so much, but the talks referred to Riemann’s original paper on the  $\zeta$  function and Apéry’s proof of irrationality of  $\zeta(3)$ .

On my fourth year I got seriously interested in algebraic geometry. I really admire the algebraic geometry group at Warsaw University, established by Prof. A. Białyński-Birula and growing stronger. After some graduate courses in Algebraic Geometry, Complex Geometry, Category Theory, Algebraic Topology, Gauge Theory and Galois Cohomology (and struggling with Hartshorne’s famous textbook) I decided to ask my professors for a master thesis subject which would allow me to get into research. Prof. A. Langer gave me

a problem concerning computing higher Frobenius direct images of vector bundles on quadrics (the problem was related to the study of D-modules and some derived category-oriented questions) in characteristic two, since his own method failed in this case. I really enjoyed this work, which gave me some self-confidence in positive characteristic and now I am studying the case of singular quadrics

My other interests in my area of specialization include toric varieties (I attended a summer school on torus actions in Lukecin, Poland in September 2009) , abelian varieties and intersection theory. I gave some talks on these subjects on Master's and Research Seminars. My mathematical „hobby” is spectral graph theory. I also wanted to get into arithmetic geometry, but alas it is hardly ever taught in Warsaw. I find mastering it one of my goals in graduate study.

I am involved in several educational projects. I have twice co-organized a summer workshop aimed at exceptional high-school students interested in mathematics, during which I gave lectures on complex analysis and on algebraic graph theory. I am also an author of several mathematical problems, which appeared on National Mathematical Olympiad, and I actively participate in organizing that contest.

As for my research goals, I am flexible as far as algebraic geometry is concerned (and the neighbouring areas of algebraic topology, commutative algebra, algebraic number theory, homological algebra etc.). I admire the beauty of Grothendieck-style abstract generality, but I fully understand that that that doing research involves also doing actual calculations, verifying and posing conjectures basing on experimental data obtained by the use of computer, and I am certainly not afraid of these methods.

Berkeley was my first choice of graduate studies in mathematics. This was mainly because I recognized Berkeley as one of the origins of modern algebraic geometry (together with IHES and Harvard). The memory of those days is present at my current university because of Prof. Andrzej Białynicki-Birula, who obtained his Ph. D. from Prof. Gerhard Hochschild in 1960, and, after his return to Poland, deeply influenced (or even established) Polish geometry school.

Doing mathematics is one of the most important parts of my life and studying at the Berkeley Mathematics Department would be a unique opportunity to fully develop my potential.