Michael (Misha) Alekhnovich 1978-2006

Misha Alekhnovich was born in Moscow, USSR, on October 26, 1978. In 1995 Misha began his studies at Moscow State University and graduated in 2000 with the equivalent of a B.A. in mathematics. In 2000-2001 Misha participated in the Special Year on Computational Complexity at the Institute for Advanced Study, and in 2001-2003 he attended graduate school at MIT. Upon receiving his PhD in 2003, Misha returned to IAS as a postdoctoral member and spent the next two years, 2003-2005, there. In 2005 he moved on to a faculty position at the University of California San Diego.

Misha tragically died in a white-water rafting accident on August 5, 2006, at age 27.

This untimely death put an end to what started–and, doubtlessly would have continued–as an exceptionally bright and promising career in our field. Misha began his work in Propositional Proof Complexity, one of the most challenging sub-areas of Complexity Theory, where he made some very impressive contributions. To name just a few, in [1, 2] Misha studied the cornerstone concept of automatizability for various proof systems and proved strong (conditional) results about their non-automatizability. These results remain unsurpassed, and they have established surprising connections between Proof Complexity and other areas like PCP or Parameterized Complexity. [3, 4] lay the ground for the theory of pseudorandom generators in proof complexity and showed how to construct such generators for a number of non-trivial systems. This theory remains one of the (very few) reasonable approaches to a central and widely open problem in propositional proof complexity. [5, 6] prove strong lower bounds for concrete proof systems; again, these results remain among the strongest known today.

In the several last years Misha also began applying his expertise gained in Proof Complexity to some adjacent areas. He had already done very interesting things in this direction, and just

before the accident he was actively working on at least two promising research projects. To name just a few of his accomplishments, [7] proved strong lower bounds in the theory of proper learning based upon novel and ingenious connections to automatizability of proof systems. [8] proved very interesting results about inherent limitations of semidefinite relaxation techniques, the latter being quite popular in the algorithmic community. [9] established strong lower bounds for solving SAT in a restricted, but natural (and, once more, very popular), model.

Besides being a rising star, Misha had a sweet, joyful and charming personality. To many of us he had become a true friend, not just a colleague and collaborator. He will be greatly missed by the community.

References

[1] M. Alekhnovich, S. Buss, S. Moran, and T. Pitassi. Minimum propositional proof length is NP-hard to linearly approximate. *Journal of Symbolic Logic*, 66:171–191, 2001.

[2] M. Alekhnovich and A. Razborov. Resolution is not automatizable unless $W[P]$ is tractable. In *Proceedings of the* 42*nd IEEE Symposium on Foundations of Computer Science*, pages 210–219, 2001.

[3] M. Alekhnovich, E. Ben-Sasson, A. Razborov, and A. Wigderson. Pseudorandom generators in propositional proof complexity. *SIAM Journal on Computing*, 34(1):67–88, 2004.

[4] M. Alekhnovich and A. Razborov. Lower bounds for the polynomial calculus: non-binomial case. *Proceedings of the Steklov Institute of Mathematics*, 242:18–35, 2003.

[5] M. Alekhnovich, J. Johannsen, T. Pitassi, and A. Urquhart. An exponential separation between regular and general resolution. In *Proceedings of the* 34*th ACM Symposium on the Theory of Computing*, pages 448–456, 2002.

[6] N. Alekhnovich. Lower bounds for k-DNF resolution on random 3-CNFs. In *Proceedings of the* 37*th ACM Symposium on the Theory of Computing*, pages 251–256, 2005.

[7] M. Alekhnovich, M. Braverman, V. Feldman, A. R. Klivans, and T. Pitassi. Learnability and automatizability. In *Proceedings of the* 45*th IEEE Symposium on Foundations of Computer Science*, pages 621–630, 2004.

[8] M. Alekhnovich, S. Arora, and I. Tourlakis. Toward strong nonapproximability results in the Lovász-Schrijver hierarchy. In *Proceedings of the* 46*th ACM Symposium on the Theory of Computing*, pages 294–303, 2005.

[9] M. Alekhnovich, E. Hirsch, and D. Itsykson. Exponential lower bounds for the running time of DPLL algorithms on satisfiable formulas. In *Proceedings of the* 31*st ICALP*, pages 84–96, 2004.