

# Preface

Oded Schramm was born on December 10, 1961, in Jerusalem, and died at the age of 46 in a climbing accident on Guye Peak, WA, on September 1, 2008. In between, he made profound and beautiful contributions to mathematics that will have a lasting influence.

In these two volumes, we have collected some of his papers, supplemented with three survey papers by Steffen Rohde, Olle Häggström and Cristophe Garban that further elucidate his work. Despite the seemingly generous size of the collection, spatial considerations nevertheless forced us to omit most of Oded's papers, and the mere fact that all of them are inspiring pieces of work led to some difficult issues on what to include and what to omit. The reader should not view our choices as an attempt to separate his best works from those that are merely great. Rather, we have tried to put together a representative collection that shows the breadth, depth, enthusiasm and clarity of his work. Others may have diverging opinions on what should or should not have been included, but we do hope that Oded himself would not have been too displeased by our choices. The papers we have included speak for themselves; let us just say a few words about how we have organized them into five sections.

Oded began his mathematical career as a geometer, making GEOMETRY the natural topic for Section 1. This section opens with Oded's first two papers from his Master's thesis in 1987 under Gil Kalai at the Hebrew University. We then move on to circle packing and conformal geometry, including examples of his extraordinarily fruitful collaboration with Zheng-Xu Hu, and end the section with the joint paper with Mario Bonk on embeddings of hyperbolic spaces. Of course geometric aspects permeate also all of the following sections. In fact, Oded once mentioned to one of us that in order to be able to think about a problem he always liked it to have a geometric component.

In the mid 1990's, Oded became interested in the topic of probability theory, which dominates Sections 2-5 of this collection. Section 2 deals in particular with the study of NOISE SENSITIVITY, pioneered in a joint paper with Itai Benjamini and Gil Kalai that opens the section. Noise sensitivity turned out to be a rich topic with applications ranging from voting systems to percolation. In the two other papers of this section, the first coauthored with Jeff Steif and the second with Christophe Garban and Gabor Pete, Oded went progressively deeper into noise sensitivity in a percolation setting, arriving at surprisingly detailed insights.

In Section 3 we have collected some of Oded's papers on RANDOM WALKS AND GRAPH LIMITS. This includes (i) a paper with Itai Benjamini establishing recurrence of random walks on suitably defined limits of finite planar graphs, (ii) the joint paper with his student Omer Angel on distributional limits of triangulations, (iii) a singly-authored paper on compositions of random transpositions, (iv) a collaboration with Yuval Peres, Scott Sheffield and David Wilson on the remarkably fruitful interplay between the infinity Laplacian and certain board games, and (v) the concise 2008 paper on so called hyperfinite graph limits.

One of the probabilistic objects that caught the strongest grip on Oded's imagination was PERCOLATION, which appeared prominently in Section 2 as a major testing ground for noise sensitivity. Papers on other aspects of percolation are collected in Section 4. Here we will see how Oded joined forces with Itai Benjamini, Russ Lyons and Yuval Peres in order to uncover many of the new

and interesting phenomena that happen when we move beyond the usual setting of percolation in a Euclidean geometry, and instead study what happens on hyperbolic lattices and other nonamenable graph structures. Most of the papers in this section are joint work with (subsets of) this team of coauthors, plus Harry Kesten who joined them in establishing a beautiful result on uniform spanning trees. We end the section on a different note, namely Oded's joint paper with Itai Benjamini and Gil Kalai making progress on the important open problem of determining the order of magnitude of fluctuations of first passage percolation on the Euclidean lattice.

Despite strong competition from Oded's other works, there seems to be a consensus view that the most important of all his contributions to mathematics is his discovery and subsequent study of SCHRAMM-LOEWNER EVOLUTION (or stochastic Loewner evolution as Oded himself preferred to call it; conveniently, the abbreviation SLE works either way), which is the topic of Section 5. SLE is a family of conformally invariant random processes in the plane that turn out to appear as the scaling limit of percolation and a variety of other critical models. We begin this section with the famous paper, published in 2000 in the Israel Journal of Mathematics, where Schramm singlehandedly discovered SLE and obtained the first preliminary results on scaling limits. Then followed a series of papers with Greg Lawler and Wendelin Werner in which SLE was exploited to deduce deep results on intersection properties of random walks; here we include only some of the highlights. We furthermore include important joint papers with Steffen Rohde, Scott Sheffield, David Wilson and Stanislav Smirnov, plus Oded's contribution to the International Congress of Mathematicians in Madrid, 2006, in which he gives a survey of the field with an emphasis on open problems.

There were no signs of a decrease in creativity or productivity on Oded's part until the untimely and tragic end, and we can only guess what further discoveries we miss because of it. Substantial parts of his work, joint with others, is still not completely written up and will appear in the coming years.

However, Oded will be missed not just because of his mathematics, but even more because of the gentle, warm-hearted and generous person that he was. Of course, the loss of him is felt most strongly by his wife Avivit, his daughter Tselil and his son Pele. But he was very much loved by the mathematical community and by everyone who knew him, as amply witnessed on the memorial blog which was set up shortly after his death: <http://odedschramm.wordpress.com/>

We hope that this collection will contribute, however modestly, to keeping the memory of Oded alive, and to nourishing the mathematical heritage he left for all of us. Yehi zichro baruch - may the memory of him be a blessing.

Itai Benjamini  
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