AMS-MAA-SIAM Frank and Brennie Morgan Prize for Outstanding Research in Mathematics by an Undergraduate Student

The new Frank and Brennie Morgan Prize stands to recognize and encourage outstanding mathematical research by undergraduate students. Undergraduates are working on problems of current research interest, proving theorems, writing up results for publication, and giving talks on their work. There is undergraduate research today at the highest standards of professional excellence. The prize was endowed by Mrs. Frank Morgan and also carries the name of her late husband. (Their son, Frank Morgan of Williams College, is on the prize selection committee.)

The first Frank and Brennie Morgan Prize was awarded at the Joint Meetings in Orlando in January 1996 to KANNAN SOUNDARARAJAN of Princeton University. An Honorable Mention was awarded to KIRAN KEDLAYA of Harvard University. The prize selection committee consisted of Kelly J. Black, Gulbank D. Chakerian, Frank Morgan, Robert Robson, John Ryff, Martha Siegel (chair), Gilbert Strang, and Lee Zia.

Kannan Soundararajan

Citation

Kannan Soundararajan (Sound) has presented a body of truly exceptional research. As an un-

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dergraduate at the University of Michigan, he had been pursuing a program of research in analytic number theory and has made outstanding contributions to that field. A year ago he solved a long-standing and much studied conjecture of Ron Graham, jointly with R. Balasubramanian. When at Bell Labs two years ago, he established asymptotic formulae for the distribution of "smooth polynomials". Especially in the last two undergraduate years he has had great success in establishing properties of the Riemann zeta function on the line $\Re s = 1/2$. His work has brought him acclaim from accomplished researchers in the field, who have cited him as a superb analytic number theorist. His work involves estimates of $|\zeta(1/2 + it)|$ and estimates for the gaps between the zeros of the zeta functional. The work that the committee found most compelling was the sophisticated

approach to the spacing of the ordinates of the zeros of the zeta function. Scholars in the field claim that his results have completely rewritten the subject. He has already had four papers appear in outstanding research journals, has had two other papers accepted, and has submitted three others.

Response

I take great pleasure in accepting this award. Over the last few years I have had the pleasant and rewarding experience of interacting with many notable mathematicians. For sharing their mathematical wisdom, their infectious enthusiasm for the subject, and their patient indulgence, I gladly thank them all. In particular I am grateful to Professors R. Balasubramanian, A. Granville, H. L. Montgomery, K. Ramchandra, and T. D. Wooley, who remain constant sources of encouragement.

Biographical Sketch

Sound was born in Madras and spent most of his high school years there. He studied at the Padma Seshadri High School, whose teachers, he claims, were responsible for stimulating his interest in mathematics. They suggested that he visit the Institute for Mathematical Sciences, which is one of the centers for mathematical research in Madras. There he came in contact with Professor R. Balasubramanian, to whom Sound owes his interest in number theory. Faculty members at the University of Michigan, where Sound was an undergraduate and a member of the 1993 fifth-ranked Putnam team, recommended him to the Morgan Prize Committee. Sound placed seventh in the Putnam Competition in 1994. He is now a graduate student in mathematics at Princeton University. Apart from mathematics he is quite fond of literature, music, and chess. He says that he hopes that someday he will play Go without blushing.

Honorable Mention

Kiran Kedlaya

Citation

Much of Kiran's research has been carried out in connection with summer research or internship programs for undergraduates. He has an impressive portfolio of four professional-level research papers that demonstrate sophistication, depth, and versatility far beyond what might be expected of a student due to graduate in June 1996. He has substantially improved on results of Babai and Sós (1985) on the size of the largest product-free subset of a finite group of order n. The referee's report on the paper calls it "lovely" and continues with, "The elementary combinatorial idea is quite ingenious." Kiran's progress on a tough problem involving outer-planar partitions of planar graphs has brought acclaim from experts, who emphasize that he has made more progress than many professionals who have tackled it. Although only a few infinite families of vertex-transitive non-Cayley graphs are known, Kiran has added another. He also has obtained several new results and new proofs of known results in the area of solving constrained Pell equations.

Biographical Sketch

Kiran Kedlaya hails from Silver Spring, MD, and is currently a senior at Harvard University studying mathematics and physics. He plans to get a Ph.D. and probably enter academia. His interest in mathematics was piqued in high school by such activities as the American Regions Math League (ARML) competition and the American Mathematical Competitions (AMC). He was a three-time winner of the USA Math Olympiad and attended the International Math Olympiad three times (winning two gold medals and one silver medal). Since graduating from high school, he has continued his involvement with the AMC, writing questions for the USAMO and assisting in the Math Olympiad Summer Program. He is also a two-time Putnam Fellow.

Kiran was recommended to the Morgan Prize Committee by Joe Gallian, who knew his work from his participation in the REU at the University of Minnesota, Duluth. Kiran's mathematical interests include algebraic number theory, algebraic geometry, and combinatorics. His non-mathematical interests include volunteering with the American Red Cross; singing in the Harvard Glee Club; playing chess, bridge, and ultimate frisbee; and learning foreign languages.