1991 Ruth Lyttle Satter Prize in Mathematics Awarded in San Francisco

The 1991 Ruth Lyttle Satter Prize in Mathematics was awarded at the Joint Mathematics Meetings in San Francisco to DUSA MCDUFF of the State University of New York at Stony Brook.

The prize was established in 1990 using funds donated to the AMS by Joan S. Birman of Columbia University in memory of her sister, Ruth Lyttle Satter. This is the first time the prize has been awarded. Professor Satter earned a bachelor's degree in mathematics and then joined the research staff at AT&T Bell Laboratories during World War II. After raising a family, she received a Ph.D. in botany at the age of forty-three from University of Connecticut at Storrs, where she later became a faculty member. Her research on the biological clocks in plants earned her recognition in the U.S. and abroad. Professor Birman requested that the prize be established to honor her sister's commitment to research and to encouraging women in science. The prize is awarded every two years to recognize an outstanding contribution to mathematics research by a woman in the previous five years.

The 1991 Satter Prize was awarded by the AMS Council on the recommendation of a selection committee consisting of Professor Birman, Linda Keen (chair), and Karen K. Uhlenbeck. The prize of $1200 was presented to Professor McDuff during the AMS Prize Session held on January 17, 1991, during the Joint Mathematics Meetings in San Francisco.

The text that follows contains the committee's citation for the award, the recipient's response at the prize session in San Francisco, and a brief biographical sketch of the recipient.

Dusa McDuff

Citation

The Committee for the Satter Prize unanimously recommends that the first Biennial Satter Prize in Mathematics be awarded to Dusa McDuff, for her outstanding work during the past five years on symplectic geometry.

A pervasive theme in that work has been the relationship between symplectic and complex geometry. She constructed the first examples of symplectic structures on a manifold which belonged to the same cohomology class and were homotopic as symplectic structures, but were not isotopic. These examples were sharp, because if the cohomology class had remained fixed during the homotopy, the forms would have to be equivalent. She went on to give other examples which put a limit to the analogy between symplectic manifolds with contact boundaries and complex manifolds with pseudo-convex boundaries. Among her outstanding work during the past two years has been a complete classification of compact symplectic manifolds which contain a symplectically embedded two-sphere with non-negative self-intersection number. Most recently, she established a beautiful and simple criterion for a symplectic four-manifold to be the blow-up of a rational or ruled complex surface and proved a surprising unicity theorem.

Dusa McDuff

Response

I am very honored to be the first recipient of this prize and want to thank Joan Birman on behalf of the whole mathematical community for instituting it. I am particularly happy to get this prize because it is for my research. I grew up in a house in which creativity was very much valued but, despite the achievements of the women in the family, males were seen to be more truly creative than females and it has taken me a long time to find my own creative voice. My life as a young mathematician was much harder than it needed to be because I was so isolated. I had no role models, and my first attempts at inventing a life style were not very successful. One important way of combating such isolation is to make both the achievements of woman mathematicians and the different ways in which we live more visible. I hope that this will be one of the effects of the Satter Prize. I'll try to do my part by telling you something of my life.

I grew up in Edinburgh, Scotland, though my family was English. My father was a Professor of Genetics who travelled all over the world and wrote books on philosophy and art as well as on developmental biology and the uses of technology. My mother was an architect, who was also very talented, but who had to make do with a civil service job since that was the best position which she could find in Edinburgh. Her having a career was very unusual: none of the other families I knew had mothers with professional jobs of any kind. There were other women on my mother's side of the family who led interesting and productive lives. I identified most with my maternal grandmother since I had her name: Dusa was a nickname given to her by H. G. Wells. She was most notable for creating a great scandal in the London of her time by running away with H. G. (this was before she married my grandfather), but she later wrote books, on Confucianism for example, and was active in left-wing politics. Her mother (my great grandmother) was also distinguished: in 1911 she wrote a book about the working class poor in London which I was pleased to find being used in Stony Brook as a textbook. In discussing the women in my family I should also mention my sister, who was the first Western anthropologist allowed to go on a field trip to Soviet Central Asia, and is now a Fellow of King's College, Cambridge, with a lectureship at the university.

I went to a girls' school and, although it was inferior to the corresponding boys' school, it fortunately had a wonderful maths teacher. I always wanted to be a mathematician (apart from a time when I was eleven when I wanted to be a farmer's wife) and assumed that I would have a career, but I had no idea how to go about it: I didn't realise that the choices which one made about education were important and I had no idea that I might experience real difficulties and conflicts in reconciling the demands of a career with life as a woman.

When, as a teenager, I became more aware of my femininity, I rebelled *into* domesticity. I gladly started cooking for my boy-friend; I stayed in Edinburgh as an undergraduate to be with him instead of taking up my scholarship to Cambridge; and when I married I took his name. (My mother had kept her maiden name for professional purposes.) I did eventually go to Cambridge as a graduate student, this time followed by my husband. There I studied functional analysis with G. A. Reid and managed to solve a well-known problem about von Neumann algebras, constructing infinitely many different II_1 factors. This was published in the *Annals of Mathematics* and for a long time was my best work.

After this, I went to Moscow for six months since my husband had to visit the archives there. In Moscow, I had the great fortune to study with I. M. Gel'fand. This was not planned: it happened that his was the only name which came to mind when I had to fill out a form in the Inotdel office. The first thing that Gel'fand told me was that he was much more interested in the fact that my husband was studying the Russian Symbolist poet Innokenty Annensky than that I had found infinitely many II_1-factors, but then he proceeded to open my eyes to the world of mathematics. It was a wonderful education, in which reading Pushkin's "Mozart and Salieri" played as important a role as learning about Lie groups or reading Cartan and Eilenberg. Gel'fand amazed me by talking of mathematics as though it were poetry. He once said about a long paper bristling with formulas that it contained the vague beginnings of an idea which he could only hint at and which he had never managed to bring out more clearly. I had always thought of mathematics as being much more straightforward: a formula is a formula, and an algebra is an algebra, but Gel'fand found hedgehogs lurking in the rows of his spectral sequences!

When I came back to Cambridge, I went to Frank Adams's topology lectures, read the classics of algebraic topology, and had a baby. At the time, almost all the colleges in Cambridge were for men only, and there was no provision at all for married students. I was very isolated, with no-one to talk to, and found that after so much reading I had no idea how to begin to do research again. After my post-doc, I got a job at York University. I was the family breadwinner and housekeeper and diaper changer (my husband said that diapers were too geometric for him to manage). At about this time I started working with Graeme Segal, and essentially wrote a second Ph.D. with him. As this was nearing completion, I received an invitation to spend a year at M.I.T. to fill a visiting slot which they had reserved for a woman. This was a turning point. While there I realised how far away I was from being the mathematician I felt that I could be, but also realised that I could do something about it. For the first time, I met some other women whom I could relate to and who also were trying to become mathematicians. I became less passive: I applied to the Institute for Advanced Study and got in and even had a mathematical idea again, which grew into a joint paper with Segal on the group-completion theorem. When back home, I separated from my husband and, a little later, obtained a lectureship at Warwick. After two years at Warwick, I took an (untenured) assistant professorship at Stony Brook, so that I could live closer to Jack Milnor in Princeton. I went to Stony Brook sight unseen. I knew no-one there and have always thought myself extremely lucky to have landed in such a fine department, although very foolhardy to have given up a tenured job for an untenured one.

After that, I had to do the work that everyone has to do to become an independent mathematician, building up on what one knows and following one's ideas. I spent a long time working on the relation between groups of diffeomorphisms and the classifying space for foliations: this grew out of my study of Gel'fand-Fuchs cohomology in Moscow and my work with Segal on classifying spaces of categories. I still worked very much in isolation and there are only a few people who are interested in what I did, but it was a necessary apprenticeship. I had some ideas and gained confidence in my technical abilities. Of course, I was influenced by the clarity of Jack Milnor's ideas and approach to mathematics, and was helped by his encouragement. I kept my job in Stony Brook, even though it meant a long commute to Princeton and a weekend relationship, since it was very important to me not to compromise on my job as my mother had done. After several years, I married Jack and had a second child.

For the past eight years or so, I have worked in symplectic topology. Here again I have been very lucky. Just after I started getting interested in the subject, it was revitalised with new ideas from several sources. Most important to me was Gromov's work on elliptic methods. I took advantage of a sabbatical to spend the spring of 1985 at I.H.E.S. in Paris so that I could learn about Gromov's techniques, and the work I did then has been the foundation of all my recent research. At the time, our child was a few months old. So I worked rather short days, but found it easy to cope since we had enough money to pay for good day care. Eventually he brought the family together. We didn't want to make him commute, and Jack did not like being left with him for the best part of each week. So Jack took a job at Stony Brook, where we are now enjoying life in one house.

In conclusion, I think that there is quite an element of luck in the fact that I have survived as a mathematician. I also got real help from the feminist movement, both emotionally and practically. I think things are somewhat easier now: there is at least a little more institutional support of the needs of women and families, and there are more women in mathematics so that one need not be so isolated. But I don't think that all the problems are solved.

Biographical Sketch

Dusa McDuff (née Margaret Dusa Waddington) was born on October 18, 1945 in London, England. She received her bachelor's degree from the University of Edinburgh in 1967 and her Ph.D. from the University of Cambridge in 1971. During her graduate school years she traveled to Moscow, where she was greatly influenced by I. M. Gel'fand.

After finishing her doctorate, she held a two-year Science Research Council Fellowship at Cambridge. She was then appointed lecturer at the University of York (1973–1976) and then at the University of Warwick (1976–1978). In 1978, she came to the United States to take a position at the State University of New York at Stony Brook, where she is currently professor of mathematics. She has held visiting positions at the Massachusetts Institute of Technology (1974-1975) and at the Institute for Advanced Study (1976-1977).

Professor McDuff gave an Invited Address at the International Congress of Mathematicians in Kyoto, 1990, and an Invited Address at the AMS Annual Meeting in Atlanta (1988). During the Joint Mathematics Meetings in Boulder in August 1989, she delivered the first AMS Progress in Mathematics lecture. For a long time McDuff's research centered on the relation between classifying spaces of groups of diffeomorphisms and the theory of foliations, concentrating particularly on the volume-preserving case. Recently, she has worked in global symplectic geometry.