

Response to the Award of the Steele Prize for Seminal Contribution to Research

I thank the American Mathematical Society, its members and the Steele Prize committee for the honor and the award of the Steele Prize.

This honor confirms what I have been suspecting for quite some time. I am becoming an old mathematician, if I am not already there. It gives me cause to look back at my research and teaching. All in all, I have found great delight and pleasure in the pursuit of mathematics. Along the way I have made great friends and worked with a number of creative and interesting people. I have been saved from boredom, dourness and self-absorption. One cannot ask for more.

My mathematical career has intersected some exciting mathematical changes. My thesis written under Richard Palais was written in the thick of the days of “Global Analysis”, a period in which the tools and methods of differential topology were applied to analysis problems. This fell into disfavor, but it must be admitted that these ideas are today taken as a matter of course as part of the subject of analysis. During my days as an analyst, I wrote a paper on the regularity of elliptic systems, which I still think is the hardest paper I ever wrote.

The next revolution was single-handedly sponsored and spearheaded by S.T. Yau, who introduced techniques of analysis into the problems of topology, differential geometry and algebraic geometry. Mind you, S.T. Yau was quite something in his younger days! I am quite proud of the paper I wrote with Jonathan Sachs on minimal spheres. Next we come to the introduction of gauge theory into topology, where I did the work which is cited in the award. I had started work on the analysis of gauge theory after hearing a lecture by Michael Atiyah on gauge theory at the University of Chicago, and was fully prepared to understand the thesis of his student Simon Donaldson, which used the two papers cited in this award. The work of Donaldson and Cliff Taubes, whom I met when he was still a graduate student, was the start of a new era in four-manifold topology. Finally, due to what was now an addiction to intellectual excitement, I tried to follow the influence of physics on geometry which is associated with the name of Ed Witten. My work in integrable systems grew out of this connection with physics. This part of my career was not entirely successful. The more physics I learned, the less algebraic geometry I seemed to know.

Given that I started my academic career in the late sixties at the University of California, Berkeley during the Vietnam War, where protests and tear gas were commonplace, it must be said that I rarely found mathematics and the academic life boring.

The accomplishments of which I am most proud are not exactly mathematical theorems. One does mathematics because one has to, and if it is appreciated, all the better! However, encouraged by my young and enthusiastic colleague Dan Freed, I became involved in educational issues. We were among the founders of the IAS/Park City Mathematics Institute. The original intent was to bring mathematics researchers, students and high school teachers together. This is now an ongoing institution with a yearly summer school, overseen by the Institute of Advanced Study in Princeton. The Women and Mathematics Program at IAS is an outgrowth of the Park City Institute. Founded by my collaborator Chuu-Lian Terng and I, the original purpose was to encourage and prepare more women to take part in the Park City Summer School. It has now grown to a self-sufficient two-week yearly program sponsored by IAS. I watch with real delight the emergence of our graduates into prominence in the mathematics community.

Another outcome of this involvement with education is our Saturday Morning Math Group at the University of Texas. We started this in conjunction with the beginnings of Park City. It is now an ongoing program which our graduate students organize for local high school students. It is often cited and much boasted of by our university. Finally, I would like to boast further of my department at the University of Texas. During the years that I have held an endowed chair in this department, we have become one of the leading departments of mathematics, admittedly below the top ranked, but still quite respectable. Certainly this is due mostly to my colleagues but I take a little credit. Our primary benefactor is also due some praise. We used to “thank Peter” after a particularly enjoyable colloquium talk and dinner and I do again now.

Starting from my days in Berkeley, the issue of women has never been far from my thoughts. I have undergone wide swings of feeling and opinion on the matter. I remain quite disappointed at the numbers of women doing mathematics and in leadership positions. This is, to my mind, primarily due to the culture of the mathematical community as well as harsh societal pressures from outside. Changing the culture is a momentous task in comparison to the other minor accomplishments I have mentioned.

I want to end by thanking my thesis advisor, Richard Palais, my two present collaborators Chuu-Lian Terng and Andrea Nahmod, my longtime friend and supporter, S.T. Yau, my colleagues, particularly Dan Freed and Lorenzo Sadun as well as all my collaborators, PhD students and assistants. My husband, Bob Williams, is due a share in this award.

