Geological Society of America

Structural Geology & Tectonics Division

2019
Career Contribution Award

Presented to Gautam Mitra

Citation by Steven Wojtal

It is an honor to have the opportunity to present Gautam Mitra for the Structure & Tectonics Division Career Contribution Award. This award is first and foremost a recognition of the scientific contributions of the recipient, and during a career that has spanned more than 40 years, Gautam has authored more than 70 papers. With students and colleagues, Gautam has insightfully interpreted rock rheology at different crustal levels and contributed significantly to our understanding of the tectonics of the Appalachians, the Idaho-Wyoming-Utah thrust belt, the Scottish Caledonides, the Korean Peninsula, and the Himalayas. Gautam's publications present original, objective, and insightful observations of the map patterns, structures, and microstructures of naturally-deformed rocks, and they draw upon a deep understanding of the mechanics and material sciences literature in interpreting them. From his first publications on ductile deformation zones in crystalline basement to his latest work with students and colleagues, such as his recent paper on fold duplexes, Gautam's work is exemplary in analyzing rock rheology and exploring the roles that rock rheology plays in the development of map-scale, outcrop-scale and microscopic structures.

Of particular note are Gautam's research contributions in three areas. One concerns the processes by which deformation localizes within fault and/or shear zones. Gautam was among the first to document the role of grain fracture in forming fine-grained matrix in deformation zones and to emphasize how fabric development facilitates strain softening in them. Second, Gautam and his students have collected extensive fabric and strain data and incorporated those data into map- and regional-scale balanced sections across the Appalachians, Rocky Mountains, Scottish Caledonides, and Himalayas. Third, Gautam has used energy minimization principles as a tool to understand the formation of rock structures. More recently, Gautam has broadened his scope to examine fluid flow in thrust belts and the geometry and kinematics of rifting.

Gautam's characteristic approach of detailed examination and careful interpretation of the rock record, across scales, continues to inspire students and to guide work in our science. In addition to four decades of sustained, high-quality research, Gautam has served the community in a variety of ways. He has mentored more than thirty graduate students, including some he inherited after the death of David Elliott. Many of them now fill tenured positions at U.S educational institutions or work in government or industry. Several international students have established themselves as scientific leaders in their home countries. Gautam also co-authored a widely used text, co-edited a Geological Society of America Special Paper, and served as editor of the Journal of Structural Geology.

In our view, there are two aspects of Gautam's career that make his research accomplishments and his contributions to our discipline especially noteworthy. First, colleagues who submitted letters in support of Gautam noted that he had been instrumental in moving our science forward. It is striking that different letters highlighted publications in different areas – microstructures and rheological behavior of fault zones and shear zones, strain measurement across a broad range of length scales, the tectonics of fold-thrust belts – as the arena in which Gautam's most important contribution lie. Second, a Gautam has been a member of a department in which he has been the structural geologist in the department and one of a few scientists working on tectonics problems. In this context, the breadth of his research and the effectiveness of the graduate training he has provided to his graduate students are all the more impressive.

On the basis of his scholarship, mentoring, and community service, then, Gautam Mitra is a most deserving recipient of this year's Career Contribution Award.

Response by Gautam Mitra

Thank you, Steve for the thoughtful citation. I am honored and deeply humbled to receive this award. I thank the Structure Geology & Tectonics division of the Geological Society of America for this honor. It is truly remarkable to be placed on the same list as many of one's heroes in the field. I am also proud to be the first Indian American to be given this award.

Let me reflect briefly on what has brought me to this point in my career. I was introduced to the mountains early when as a 12-year old I went off to boarding school in Naini Tal in the Kumaon Himalayas; little did I know that many years later I would return to Kumaon with a graduate student to construct the first balanced cross-section through the Himalayas and discover in the process the importance of the Ramgarh thrust and the Lesser Himalayan Duplex in regional shortening. This has now been shown for much of the Himalaya, particularly by the efforts of Pete DeCelles and his coworkers.

In India you have to pick your major to be admitted to college, and I stumbled into Geology at Presidency College (Calcutta) knowing little or nothing about it – I was hooked from the first day as I was introduced to Ramsay style structural geology by Prof. Dhruba Mukhopadhyay who had just returned to India after completing his PhD at Imperial College under John Ramsay.

I started graduate school in the US in Bill Brace's lab at MIT and in one year I learned an enormous amount of material science and experimental techniques, and their usefulness in interpreting geologic structures. But I also realized that experimental work was not where my research future lay, and that I needed to be out in the field. I was very fortunate to be able to switch to Johns Hopkins and join Dave Elliott's first group of students that included my brother Shankar, Steve Boyer, and later Steve Wojtal, Nick Woodward and Debbie Spratt – a remarkable group of people that fed off one another in a wonderfully stimulating learning environment. Our professors included Ernst Cloos, Hans Eugster, George Fisher, and later Bruce Marsh. But most of all I benefited from Dave Elliott's mentoring – his comprehensive approach to structural problems, his infectious enthusiasm, his love of field-work, and his open-door policy with his students – a style that I have tried to emulate. My own work (on fold-thrust belt kinematics, fault zone evolution has been focused on structures at all scales from the microscopic to the regional, and in discovering the beautiful interweaving patterns and interdependence between them.

I spent 4 years teaching at the University of Wyoming, benefiting greatly from collaborations with Ron Frost, Scott Smithson and Kevin Furlong, and from guiding my first cohort of graduate students. I moved to the University of Rochester in 1981, but have been back to the Rocky Mountain west every year since for its rich supply of structural problems. About this time a chance meeting with Steve Marshak at a conference in Australia and an exchange of ideas led to th writing of the book "Basic Methods of Structural Geology".

At Rochester, over the years, collaborations with Pete DeCelles, Bob Poreda, Carmie Garzione, and John Tarduno have led me into new research directions beyond traditional structural geology. Attracting graduate students to a small program like Rochester was difficult, but it has been my good fortune to have had a continuous stream of unique and wonderful graduate and undergraduate research students – you know who you are so I won't mention names. All I had to do was to give them a few basic tools through courses and let them forge ahead in their own directions – they have been independent, innovative, enthusiastic and diligent, and mentoring them has been enormously satisfying. To my students: I thank you all for letting me share in your discoveries – I have learned more through you than I could ever have taught you.

It is customary to have words of advice for success to students in the audience: I generally tell my own students : find yourself a mentor that you can communicate with easily, respect past discoveries but don't be afraid to question dogma (i.e. think outside the box), and try not to miss those serendipitous moments for that is how many great discoveries are made.

Finally, I would like to thank my wife Judy Massare and my son Eshan for their support and years of enjoyable outdoor experiences.