Long-Term Prize Fellow Update—*Manjul Bhargava*

INTERVIEW

Tell us about your activities since becoming a CMI Long-Term Prize Fellow. How has the fellowship facilitated your research?

Bhargava was awarded a five-year appointment as a CMI Long-Term Prize Fellow in July of 2000 and holds visiting positions at Harvard University and Princeton University. His research interests span algebraic number theory, combinatorics, and representation theory. His Ph.D. thesis, entitled "Higher Composition Laws," has gained worldwide acclaim as one of the most innovative theses in number theory in the past 20 years. Bhargava has also made fundamental contributions to the representation theory of quadratic forms, and to p-adic analysis.

I feel very fortunate and honored to have been able to carry out my mathematical research as a Long-Term Prize Fellow with CMI. The CMI Long-Term Prize Fellowship is really an ideal position for a mathematician, in that it allows one to pursue research in whatever way, and in whatever location, one finds most conducive to creativity. As such, I have been able to spend time at several wonderful institutions of higher learning (predominantly Princeton, Harvard, Berkeley, IAS and MSRI), and each of these places has provided me with an environment that has truly inspired my research and expanded my mathematical horizons. In addition, CMI has always strongly supported and encouraged me to attend various important conferences around the world to discuss my work with experts in my field; this too has been of immense benefit to me! To be able to work and travel with such flexibility—without the usual distractions of an academic job—does wonders for the creative process, and it allows one to take risks in one's work that one might not want to—even dare to—take otherwise. For all these reasons and more, I can say with confidence that much of the rapid progress that I have been able to make over the past year and a half could not have been possible were it not for the manifold research opportunities that the Clay fellowship has provided me.

What is the primary focus of your research today?

My work concentrates on unraveling some of the mysteries connecting number theory and Lie theory. One of the advances I have made while a fellow with CMI is a discovery of a certain "fusion" operator, which takes two algebraic objects of a certain type and allows one to combine them together to form a new algebraic object. Recently I found that this fusion operator also has a remarkable analogue on the Lie groups side! It is this

analogy that I am currently pursuing and attempting to make precise, the motivation being that a complete understanding of this relationship would necessarily shed light on both number theory and on the theory of Lie groups.

Last October, *Popular Science* magazine named you one of America's ten most brilliant young scientists working today. What was your reaction to this award? Can you explain what put you in the spotlight?

Obviously it was a great honor for me, but in the bigger picture what made me very happy about the announcement was that they chose a pure mathematician among the ten scientists featured in their magazine! I feel this reflects a change in attitude in the media and the public toward mathematics, and in particular it indicates a growing realization of the important role that mathematics plays in society and in the sciences. I hope that the feature about a mathematician's work in *Popular Science* will help to create interest and public awareness toward the beauty of mathematical thought, and will inspire young readers to learn and pursue mathematics.

What can you add about CMI's effort to address the needs of mathematicians?

The Clay Mathematics Institute has attracted the very best of talents in the country as its members and as recipients of its fellowships. Thanks to the vision of Mr. and Mrs. Clay that such an unprecedented support and advancement of mathematical research is taking place! The Institute's excellent scientific advisory board, able administrators and staff, and the genuine and profound personal interest of the Clays in furthering the cause of mathematical research has made the Clay Institute one of the world's best research organizations. I am honored to be a part of its research team, and I hope that CMI will continue to succeed in all its important endeavors for years to come.

Only 28, Bhargava has already impressed many leaders in his field. His Ph.D. advisor, Andrew Wiles (known for solving the centuries-old puzzle known as Fermat's Last Theorem), says Bhargava's thesis was one of the strongest he's seen in 20 years. "We are watching him very closely. He is going to be a superstar," says Peter Sarnak, a Princeton colleague. "He's amazingly mature mathematically. He is changing the subject in a fundamental way." For his Ph.D., which he earned last year, Bhargava extended some work of the legendary 19th-century German mathematician Carl Friedrich Gauss, work that forms the basis of modern algebraic number theory.

From Paul Hoffman's article on Manjul Bhargava in "Popsci's Brilliant 10," *Popular Science*, November, 2002.