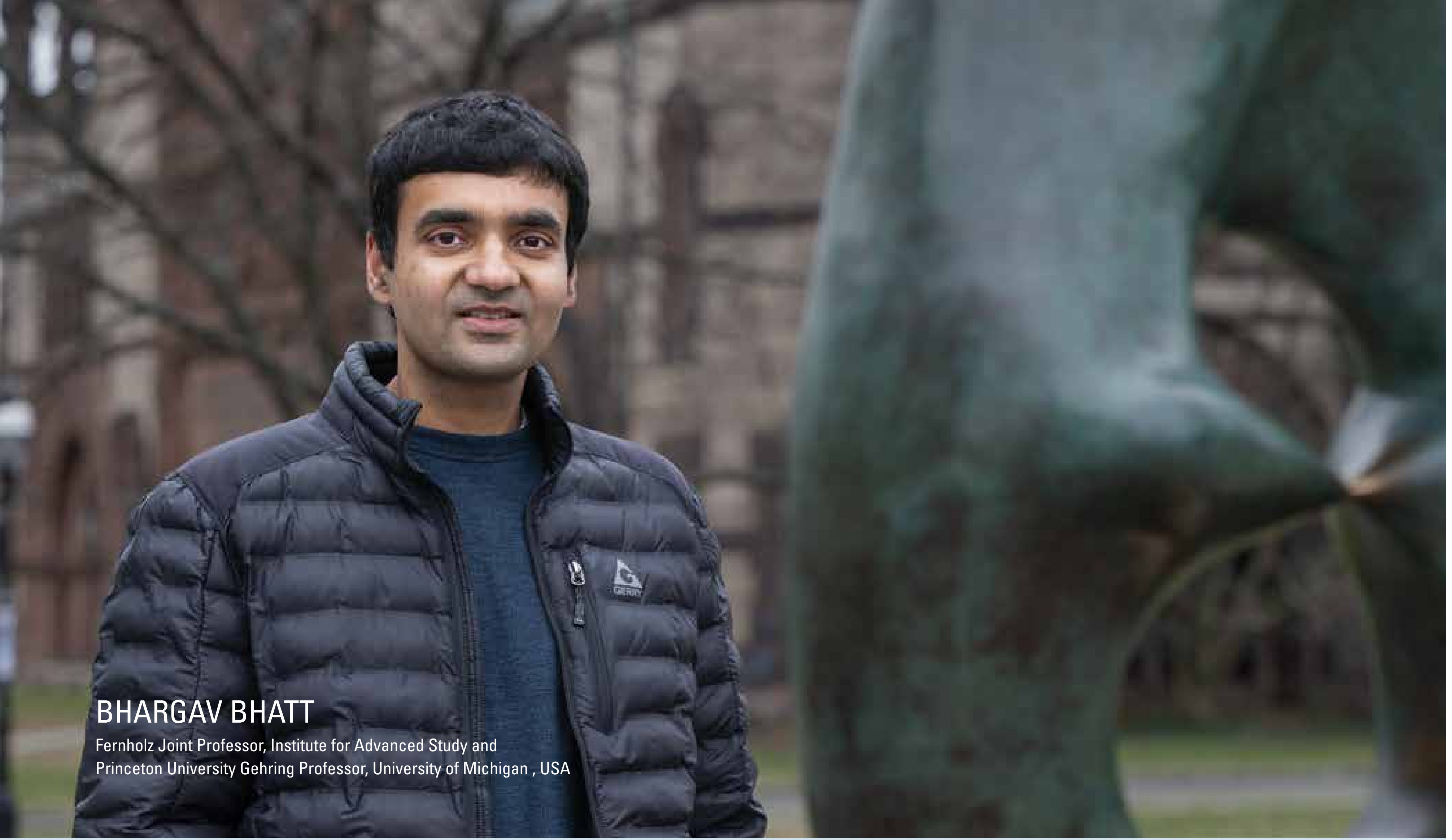


BHARGAV BHATT

Fernholz Joint Professor, Institute for Advanced Study and Princeton University Gehring Professor, University of Michigan , USA

Prof. Bhargav Bhatt has been the Fernholz Joint Professor at the Institute for Advanced Study and Princeton University since 2022. He has been on the faculty at the University of Michigan as Gehring Professor, since 2014. He obtained his Ph.D. from Princeton University in 2010, and his B.S. in Applied Mathematics from Columbia University in 2005. He was born in Mumbai and studied until high school there.

Prof. Bhatt's work has been recognized by a number of prestigious prizes: Clay Research Award (2021), New Horizons Prize in Mathematics (2021), Nemmers Prize (2022). He was a Plenary speaker at the International Congress of Mathematicians in 2022.

MATHEMATICAL SCIENCES

The Infosys Prize 2023 in Mathematical Sciences is awarded to Prof. Bhargav Bhatt for his outstanding contributions to arithmetic geometry and commutative algebra. Bhatt's fundamental work on prismatic cohomology (joint with Peter Scholze), his work around the direct summand conjecture in commutative algebra, introduces new ideas and powerful methods in an area at the heart of pure mathematics.

SCOPE AND IMPACT OF WORK

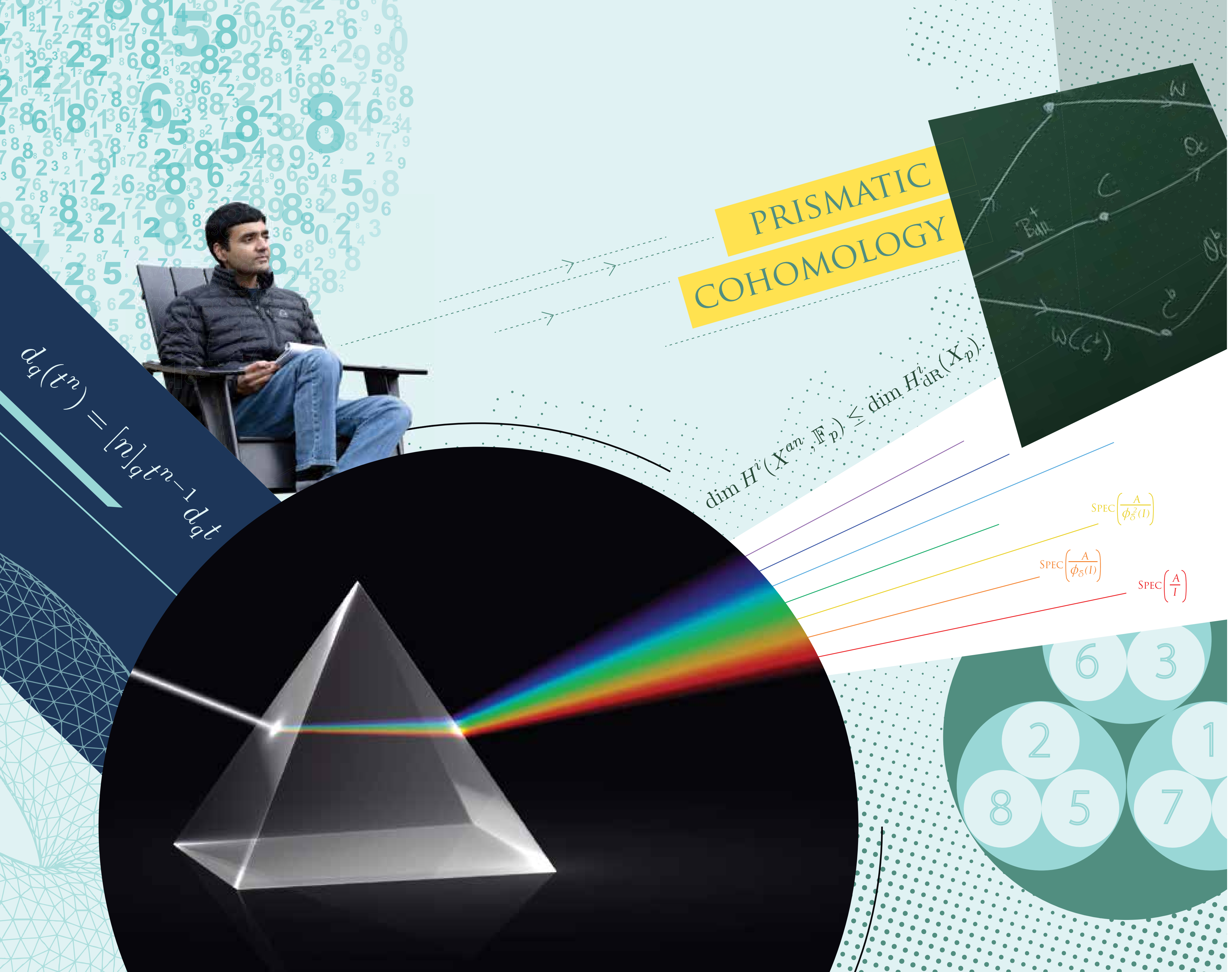
Prof. Bhargav Bhatt's two main research areas are *p*-adic geometry (in the shape of *p*-adic Hodge theory) and commutative algebra. Prof. Bhatt has made groundbreaking contributions to both areas and his research has revealed completely unexpected relationships between the two, showing that the deepest questions in both have surprising and very close connections. The theory of prismatic cohomology of Bhatt and Scholze represents a truly fundamental discovery in arithmetic algebraic geometry, which will eventually be part of the standard toolkit of every mathematician working in the area. It has already attracted a huge amount of attention and given rise to many applications. Prof. Bhatt is at the forefront of these developments. He is among the top leaders in arithmetic algebraic geometry worldwide. Prismatic cohomology is the right theory of *p*-adic cohomology of *p*-adic schemes which unifies all the previously existing theories and sheds new light on the structure of those. Much work by mathematicians over the past five decades can now be viewed retrospectively as steps toward the Bhatt-Scholze theory of prismatic cohomology

CITATION BY THE JURY

Prof. Bhargav Bhatt is an internationally renowned expert in arithmetic algebraic geometry and commutative algebra. He has made fundamental contributions to both subjects. Prof. Bhatt is at the forefront of a revolution in *p*-adic geometry. For each prime p, there is a *p*-adic geometry, with a very different flavor from the geometry of the real world we live in. Despite this difference, *p*-adic geometry has found spectacular applications in solving famous conjectures in number theory, like the Mordell conjecture and Fermat's Last Theorem. One of Bhatt's significant mathematical contributions is his introduction (in joint work with Peter Scholze) of the theory of prismatic cohomology. He has applied these developments to solve longstanding problems in commutative algebra.

I would like to congratulate Bhargav for winning the Infosys Prize 2023 in Mathematical Sciences. His work has produced some of the most exciting and impactful mathematics done anywhere in the world over the last decade. His work on prismatic cohomology has introduced a powerful set of methods in p-adic geometry. And there is so much more to come!

Chandrashekhar Khare



THE SHAPE OF THINGS

Prof. Bhargav Bhatt works in two areas of mathematics — algebraic geometry and number theory. The fundamental objects of study in algebraic geometry are the solution sets of systems of polynomial equations. These can be studied using the dual perspective of equations (algebra) or spaces of solutions (geometry). It is one of the biggest fields in math which has seen a great deal of research in the last 60 to 70 years. In particular, algebraic geometry has deep applications to solving problems in number theory—the branch of mathematics concerned with properties of whole numbers and arguably the oldest topic in mathematics.

The bulk of Prof. Bhatt's work lies in a discipline called p-adic geometry, which lies at the intersection of algebraic geometry and number theory. Given a prime number p (for example, take p to be 3), the German mathematician Kurt Hensel, in the 19th century, introduced an alternate number system, the *p*-adic numbers, that is sometimes more useful than standard (real) number system for tackling problems in algebraic geometry and number theory.

To explain Hensel's creation, note that the notion of distance in our world relies on the usual notion of sizes of numbers; for instance, in the more familiar number system, the distance from 0 to 6 is smaller than the distance from 0 to 9. Hensel observed that there is an alternative (*p*-adic) way to measure distances: in the *p*-adic world, a number is closer to 0 if it is more divisible by p. For instance, in the 3-adic world, the distance from 0 to 9 is smaller than the distance from 0 to 6 since 3 divides 9 twice but it only divides 6 once. In this way, for each prime number p, Hensel built the *p*-adic numbers; work of various mathematicians in the last century then expanded on Hensel's creation to build a new geometry: *p*-adic geometry. While different from standard geometry and initially counterintuitive, *p*-adic geometry has found spectacular applications in solving important conjectures in mathematics such as Fermat's Last Theorem and the Mordell conjecture.

Bhargav Bhatt has made fundamental contributions to *p*-adic geometry by providing new techniques for understanding p-adic spaces. More precisely, Prof. Bhatt (with collaborators Matthew Morrow and Peter Scholze) introduced a theory called prismatic cohomology, which provides a novel way to "measure holes" in *p*-adic spaces. This theory unifies all previously known cohomology theories in the *p*-adic world and sheds new light on their relationship; it can be regarded as a *p*-adic counterpart of the classical work of W.V.D. Hodge in the 1930s in classical geometries. Despite being relatively recent, the theory has already found applications in the solution of longstanding questions in algebraic topology and commutative algebra.