

Hodge Conjecture

by Manjil Saikia - Tuesday, March 27, 2012

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[Editor: This is the next part in our series on the [Millennium Problems](#). **William Vallance Douglas Hodge** FRS (17 June 1903 – 7 July 1975) was a Scottish mathematician, specifically a geometer. His discovery of far-reaching topological relations between algebraic geometry and differential geometry—an area now called Hodge theory and pertaining more generally to Kähler manifolds—has been a major influence on subsequent work in geometry.]

Hodge conjecture is a problem in algebraic geometry which forms an abstraction of coordinate geometry where sets of solutions of polynomial equations are studied. A projective algebraic variety represents the set of simultaneous solutions of a system of polynomial equations in a projective space which is essentially the set $P(V)$ of lines through the origin of a vector space V . The idea of a projective space relates to the way an eye or a camera projects a 3D scene to a 2D image. If the set of solutions which form a manifold, has no sharp edges/points etc. it is called non-singular. We shall not go into the other technical terms in the statement of the Hodge conjecture which is

Hodge Conjecture : On a projective non-singular algebraic variety over \mathbb{C} , the set of complex numbers, any Hodge class is a rational linear combination of classes $cl(Z)$ of algebraic cycles.

William Hodge, a distinguished British mathematician working at Cambridge, announced the conjecture in his address at the 1950 International Congress of Mathematics held at Cambridge, England. This conjecture has now been declared as a millennium problem.

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