

## *Fano manifolds and the Lefschetz defect*

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**Abstract:** We will discuss the geometry of a (smooth, complex) Fano variety  $X$ , first introducing the Lefschetz defect and its properties, and then focusing on Fano 4-folds and their birational geometry. The Lefschetz defect  $\delta(X)$  is an invariant of  $X$  which relates the Picard number of  $X$  to that of its prime divisors; it is a non-negative integer. If  $\delta(X) > 3$ , then  $X$  is a product of a del Pezzo surface with another Fano variety. When  $\delta(X) = 3$ ,  $X$  has a fibration in del Pezzo surfaces with a very precise structure. We will discuss these results, that allow to classify completely Fano 4-folds  $X$  with  $\delta(X) > 2$ . Then we will see how birational geometry, together with the Lefschetz defect, can be used to explicitly study and classify Fano 4-folds with large second Betti number  $b_2$ . In particular, when  $b_2(X) > 12$ , then  $X$  is a product of del Pezzo surfaces.