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Smith, James T.

Orthogonal geometries. I.

Geometriae Dedicata **1** (1973), *no. 2,* 221–235.

The author presents a concept of incidence geometry with orthogonality for arbitrary dimension and admitting euclidean, hyperbolic and elliptic models. After stating that the lattice of all flats through a point o is a projective space, he uses the orthogonality to construct a polarity in this space in the sense of H. Lenz [Math. Ann. **146** (1962), 369–374; MR0139033]. The notion of the reach of a flat x—the union of x and all the lines perpendicular to x—is characterized by means of such a polarity and discussed in detail, especially to describe properties of orthocomplemented flats x, i.e., those such that $x =$ reach x. The orthogonality of flats is defined in a natural way and used to show that every flat finite-dimensional over an orthocomplemented flat is itself orthocomplemented. In order to get an equivalent for finite codimensional flats, an orthogonalization process is studied, and the finite co-dimensional orthocomplemented flats are characterized as the intersections of a finite number of pairwise orthogonal orthocomplemented hyperplanes. *Irene Pieper-Seier*